Commercial Products

Service Tips

Part No. 94826SL, Rev. F

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General Information

Safety

The Toro Company cares about your safety. Make sure you read and understand the Operator's Manual for your machine before operating or servicing it. Become familiar with all safety signs (decals) on the machine.

To further assist in safety education, The Toro Company and the St. Paul Fire and Marine Insurance Company have developed a comprehensive operator safety education program, specifically designed for golf course employees and other operators of commercial mowing equipment.

Turf Maintenance Equipment Safety Education Program (English and Espanol): Part No. **92794SV**

Operator Training Videos

Operator Training Videos help demonstrate procedures for safe operation and daily maintenance of Toro Commercial Products. Each VHS cassette contains English and Espanol versions.

Visit the Customer Care pages of the Toro web site for a listing of available videos as well as on–line slide shows and quizzes. Go to **www.toro.com/golf** or **www.toro.com/grounds** and select Customer Care.

Preventive Maintenance

To get the most out of your equipment investment, it is important to have a good preventive maintenance program. Doing scheduled maintenance and adjustments will prolong the life of your equipment, help prevent expensive downtime and give the best possible quality of cut and performance. Experience has shown that a high percentage of problems that occur in turf equipment have developed over a period of time and could have been prevented by adjustment, lubrication, or other required maintenance.

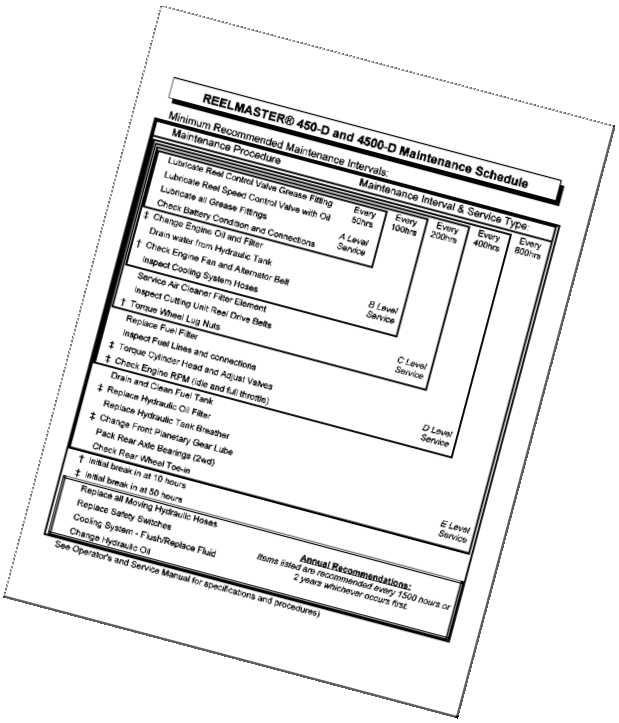
Follow the maintenance and adjustment recommendations listed in the Operator's Manual. Some products may also have a Quick Reference maintenance decal on the machine. Recommended maintenance intervals should be considered minimum requirements. If the equipment is operated in particularly harsh conditions, such as very hot weather, during the "grow in" period after construction, or on topdressed greens, these procedures may have to be performed more often.

Use original Toro parts when doing maintenance or repairs. These parts have been tested and designed for this specific, very demanding, application. "Will fit" parts may look the same and fit, but they can give totally different performance. Don't take a risk on your important equipment investment by saving a little money now that can cost you expensive repairs or increased maintenance intervals later.

Maintenance Schedules

Keep records for each machine to make sure these maintenance procedures are being performed at the proper time. These records will also help you predict parts inventory needs. If you keep a stock of required maintenance parts, such as filters, bedknives, belts and seals, you won't be caught in a situation where important maintenance was not performed on schedule because of lack of parts.

Maintenance schedules are included in your Operator's Manual.


REELMASTER® 450-D and 4500-D Maintenance Schedule
Minimum Recommended Maintenance Intervals
Maintenance Procedure
Maintenance Interval & Service Type
Lubricate Reel Control Valve Grease Fitting
Lubricate Reel Speed Control Valve with Oil
Lubricate all Grease Fittings
Every 50hrs.
Every 100hrs
Every 200hrs
Every 400hrs
Every 800hrs
‡ Change Engine Oil and Filter
Drain water from Hydraulic Tank
† Check Engine Fan and Alternator Belt
Inspect Cooling System Hoses
A Level Service
Service Air Cleaner Filter Element
Inspect Cutting Unit Reel Drive Belts
‡ Torque Wheel Lug Nuts
B Level Service
Replace Fuel Filter
Inspect Fuel Lines and connections
‡ Torque Cylinder Head and Adjust Valves
‡ Check Engine RPM (idle and full throttle)
C Level Service
Drain and Clean Fuel Tank
‡ Replace Hydraulic Oil Filter
Replace Hydraulic Tank Breather
‡ Change Front Planetary Gear Lube
Pack Rear Axle Bearings (2wd)
Check Rear Wheel Toe-in
† Initial break in at 10 hours
‡ Initial break in at 50 hours
D Level Service
Replace all Moving Hydraulic Hoses
Replace Safety Switches
Cooling System - Flush/Replace Fluid
Change Hydraulic Oil
Annual Recommendations:
Items listed are recommended every 1500 hours or 2 years whichever occurs first.
E Level Service
See Operator's and Service Manual for specifications and procedures)

Service Manuals

Service Manuals are an important supplement to your Operator's Manual; they provide information for trouble-shooting, adjusting, testing and repair of major systems and components on your machine.

NOTE: While most items on Toro equipment are easily maintained and serviced, some service procedures require specialized skills, tools and knowledge. These special services are best performed by your Toro Distributor.

These Manuals are available in English language only.

Visit the Customer Care pages of the Toro web site for a listing of available Service Manuals. Go to **www.toro.com/golf** or **www.toro.com/grounds** and select Customer Care.

The complete collection of Service Manuals for Commercial Products is also available on the Service Reference CD–ROM.

Service Reference CD–ROM

A CDROM is available that contains a collection of all available Service Manuals and Maintenance Schedules for Toro Commercial Products. This CD–ROM also contains Training Guides on various topics, such as Fundamentals of Hydraulics, and Electrical Systems and Components. Most of the documents on this CD–ROM are in English language only. Some Training Guides on this CD are also provided in Espanol.

Service Reference CD–ROM Part No. **02094SD**

TORO
Commercial Products
This CD-ROM contains:
Adobe Acrobat PDF files of Service Education Materials for Toro Commercial Products
Adobe Acrobat Reader 3.02
To view documents on this CD-ROM:
Use Acrobat Reader to open the file 1service.pdf
To install Acrobat Reader:
Open the appropriate folder and double-click on the install program.
Windows 95 or Windows 98: \acrobatwin95\ar302.exe
Windows 3.1: \acrobatwin31\ar16e001.exe
Macintosh: \acrobatmac\ar302.bin
Service Reference
Part No. 99016SD
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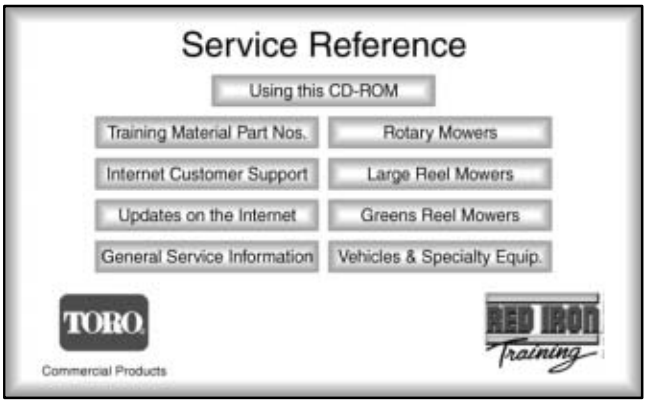
The files on this disk are in Adobe Acrobat PDF format (Portable Document Format). If your don't already have the Adobe Acrobat Reader installed on your PC, the Acrobat Reader install program is included on the disk.

The PDF documents retain the appearance of the original published materials and can be viewed on your computer screen or printed out for reference.

For easy navigation, a "point and click" menu system is provided to access the documents.

System Requirements:
Pentium processor based computer.
Microsoft Windows 95, Windows 98, Windows NT 4.0, WIndows ME, Windows 2000 or Windows XP.
32 MB RAM
10 MB available hard disk space.
CD–ROM drive.



Customer Care the Internet

Toro has a Customer Support page for Commercial Products on the Internet.

Go to **www.toro.com/golf** or **www.toro.com/grounds** and select Customer Care. Here you will find useful information for almost the entire line of Commercial Products. Within these pages you will find links to:

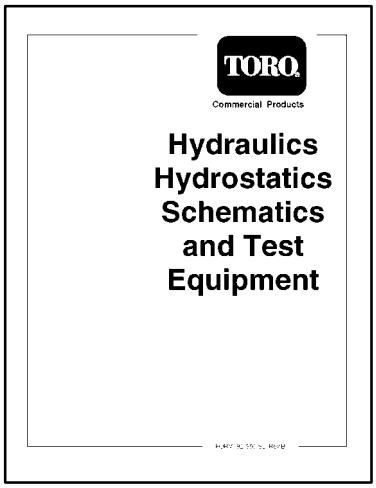
– Service Bulletins
– Service Tips
– Service Manuals
– Service Training Guides
– Operator Training

Training Guides

Training guides can be an important reference tool to help you understand some of the fundamentals behind maintaining and servicing your equipment. Use these training guides as supplements to your Operator's Manuals and Service Manuals.

Visit the Customer Care pages of the Toro web site for a listing of available Service Training Guides. Go to **www.toro.com/golf** or **www.toro.com/grounds** and select Customer Care.

The complete collection of Service Training Guides for Commercial Products is also available on the Service Reference CD–ROM.



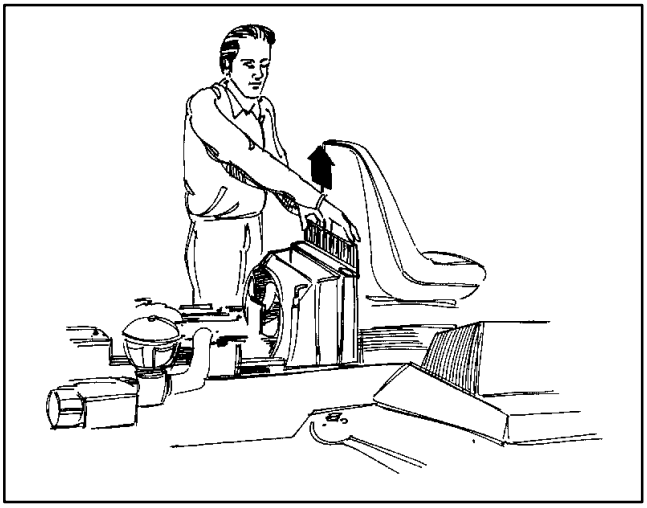
Operate Toro Turf Maintenance Equipment at Full Engine RPM

Hydraulic systems and other drive systems on Toro turf maintenance equipment are designed for operation at full governed engine RPM. Operating engine powered mowers, sweepers or aerators at less than full engine RPM can result in poor performance and unsatisfactory results.

NOTE: On machines with hydrostatic drive systems, the traction pedal is used to control forward speed and "gearing". For example, as you let up on the pedal, forward speed decreases, but power transmitted to the wheels increases. When you get in a difficult traction situation, such as going up a hill, the tendency may be to push down on the traction pedal – don't – instead, let up on the pedal to get a lower "gear" and more power to the wheels.

Cleaning Radiators, Oil Coolers and Screens

When cleaning or removing debris from radiators, oil coolers or cooling screens, always use low pressure compressed air (less than 90 PSI). Be careful not to bend the cooling fins.



Do not use water to clean radiators, oil coolers and screens. Water, combined with dirt and debris can plug the cooling passages in a radiator or oil cooler. The debris can often contain some amount of turf chemical or fertilizer residue. These chemicals, combined with water and debris, can create a corrosive mixture which may accelerate deterioration of metal components, such as radiators, oil coolers and sheet metal parts.

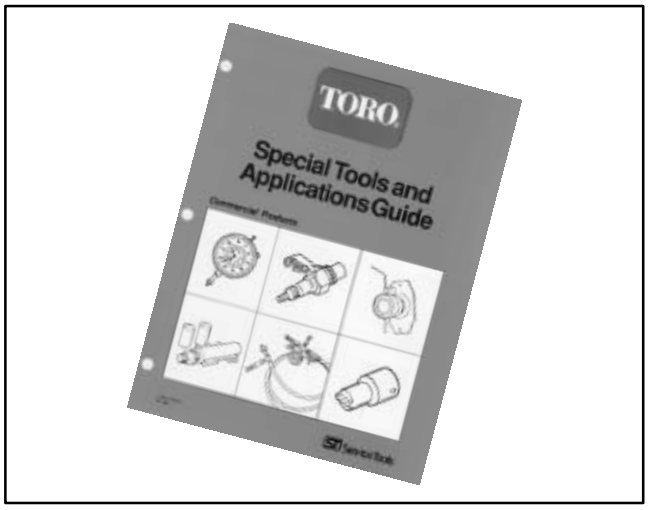
Washing the Machine

In some areas “reclaimed” or “gray” water may be used for irrigation. This water can greatly accelerate the deterioration and corrosion of metal components. Do not use this “reclaimed” or “gray” water supply when rinsing equipment at the end of the day. Always use fresh clean water to rinse equipment.

Use compressed air to clean areas where there are many electrical connections or exposed fuses, such as under the instrument panel or seat.

Special Tools

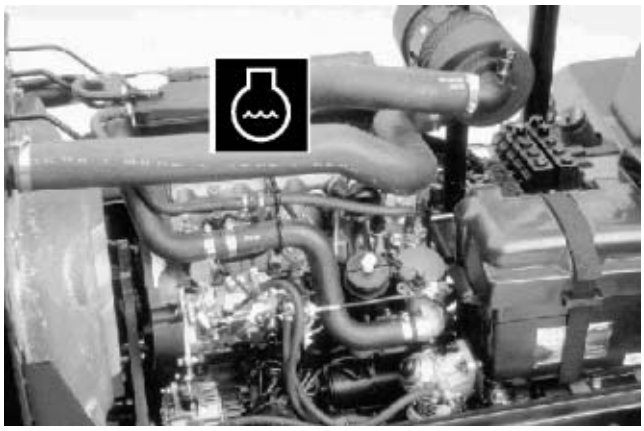
Special tools are available for servicing Toro Commercial Products. The *Special Tools and Applications Guide* for Toro Commercial Products shows service tool applications. Some special tools may also be listed in the Toro Parts Catalog for your machine. See your Toro Distributor for more information.



Use Proper Coolant in PEUGEOT Diesel Engines

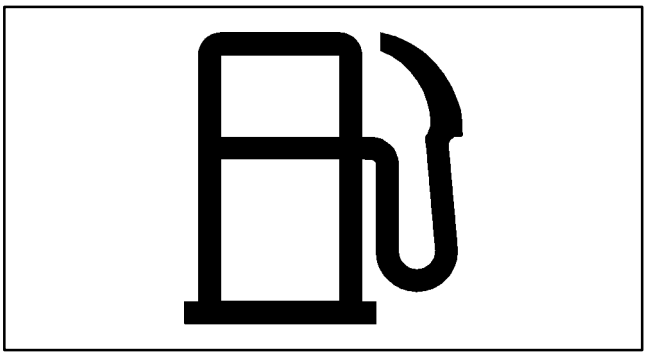
Peugeot recommended coolant/anti–Freeze is available from Toro in 1 gallon containers. This specially formulated coolant is strongly recommended by Peugeot when servicing cooling systems on Toro equipment powered by a Peugeot Diesel engine. NOTE: Peugeot now also approves the use of Havoline Dex–Cool brand anti–freeze/coolant in Peugeot engines as a substitute for Toro supplied anti–freeze.

Peugeot recommended
Coolant/Anti–Freeze: Part No. **93–7213** (1 Gal.)



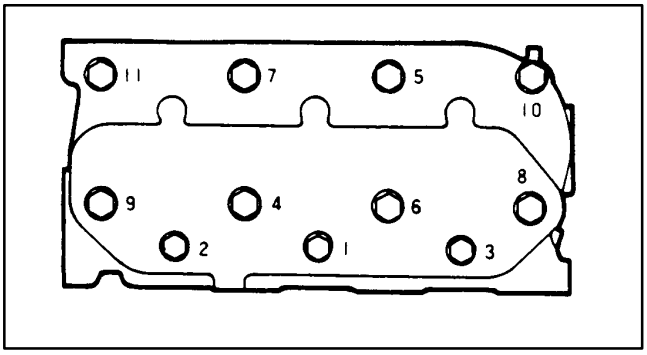
Fuel Quality

One item that is often overlooked, that can cause machine performance problems or expensive repairs, is fuel quality. Keep you fuel storage tanks full to help prevent condensation. If you have above ground tanks, they should be covered with a roof to prevent heat from sunlight causing degradation of the fuel. Make sure your storage tank has a water separator and good filter to prevent contaminated fuel from getting into your equipment. Use a fuel stabilizer additive when fuel is stored in portable fuel containers or in the machine.



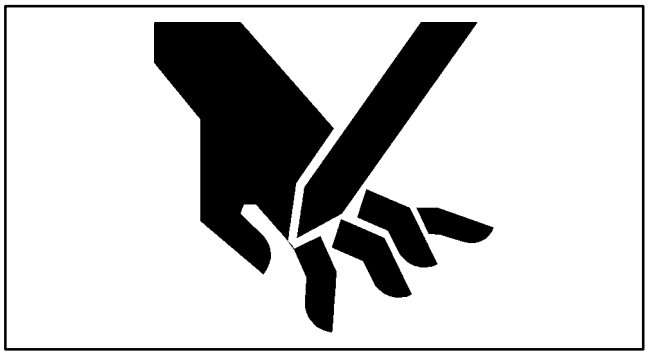
Engine Head Bolt Torque

Many engines used in Toro Commercial Products require tightening of cylinder head bolts and/or valve clearance adjustment as a scheduled maintenance procedure. For example, Mitsubishi L–Series engines, used in the Groundsmaster 220–D/223–D, Greensmaster 3000–D and Reelmaster 223–D/5100–D require service after the first 50 hours of operation, then every 400 hours operation). Other machines may have other requirements. Failure to follow these recommendations could reduce the life of the engine, cause reduced performance, or head gasket leakage.



Main Cause of Reel Mower Injuries

There are some basic safety rules that you should always follow when working with cutting units:



Whenever you check the cutting units for bedknife to reel contact, or to remove an object, make sure the cutting units are disengaged, the ignition is off and the key is removed.

Wear sturdy work gloves and use a piece of wood or a tool to rotate the blades.

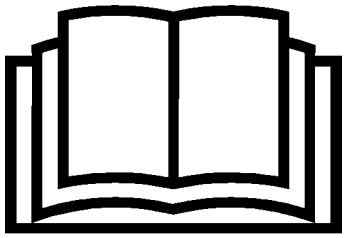
If adjustments are necessary, have a trained technician make them.

NEVER give anyone a ride on the machine.

Always turn the cutting units off when someone gets near the machine.

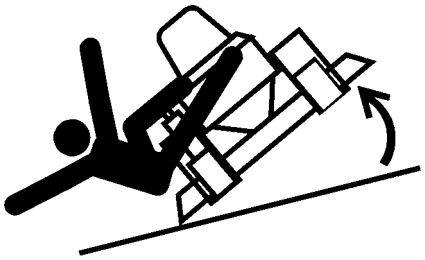
Top Five Safety Tips

1. Before starting the engine, study the Operator's Manual. Read each safety decal and warning label on the machine and watch the Operator Training Video. Be sure you are familiar with the equipment and do a pre–operation check of all safety interlocks, shields, guards and deflectors. They should all be in place and working properly before using the equipment. NEVER bypass the safety interlocks.

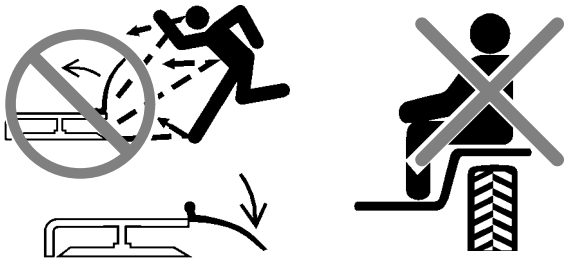


2. Always shut off the engine and engage the parking brake when leaving the operator's position.

3. Be extra careful on hills and adjust your speed according to the conditions. Wet conditions, hills, rough terrain and obstacles require slower speeds, perhaps a lot slower.



4. Remember that you are responsible for the safety of others near you. If anyone enters the immediate area you are mowing, stop and wait for them to leave the area before you continue mowing. Never give anyone a ride, even for a short distance.



5. Wear proper clothing and safety protection equipment, such as eye and ear protection. The Operator's Manual and Video give more detail on what to wear. Your supervisor can tell you about any local requirements.

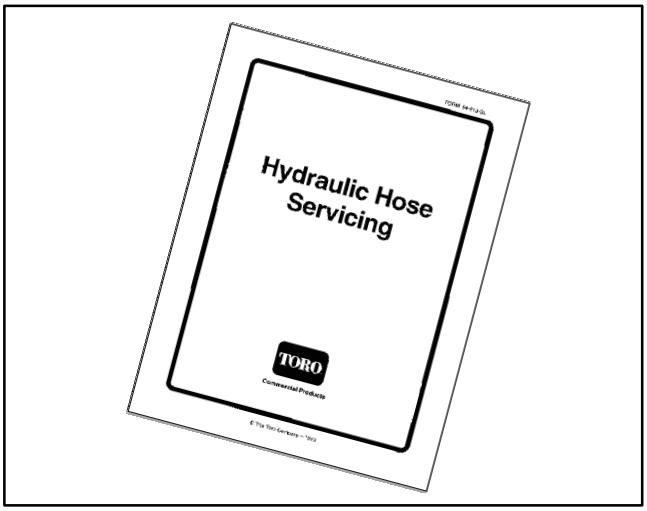
Hydraulic Systems

Hydraulic Hoses

Hydraulic hoses are subject to extreme conditions such as, pressure differentials during operation and exposure to weather, sun, chemicals, very warm storage conditions or mishandling during operation or maintenance. These conditions can cause damage or premature deterioration. Hoses that move during operation are more susceptible to these conditions than others.

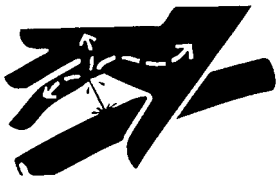
Inspect the hoses frequently for signs of deterioration or damage. Make sure hoses are properly routed and protected from abrasion. **NOTE:** Toro recommends replacement of moving hydraulic hoses, such as those connected to cutting unit drive motors, every 2000 hours or 2 years, whichever comes first.

When replacing a hydraulic hose, be sure that the hose is straight (not twisted) before tightening the fittings. This can be done by observing the imprint on the hose. Use two wrenches; one to hold the hose straight and one to tighten the hose swivel nut onto the fitting. Use procedures shown in the *Toro Hydraulic Hose Servicing Manual, Part No. 94813SL*. This manual is available in English language only.



WARNING

Before disconnecting or performing any work on hydraulic system, all pressure in system must be relieved by stopping the engine and lowering or supporting the implement.



Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and do serious damage. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

O–Ring Kit

O–ring face seal connections on Toro equipment require the use of special 90 Durometer O–rings. Toro recommends that the O–ring be replaced whenever a connection is loosened.

An O–ring kit is available that contains O–rings for commonly used ORFS and SAE hydraulic connections.

O–Ring Kit: Part No. **16–3799**

Hydraulic Filters

New machines develop residue in the hydraulic system from the normal break–in process. It is very important to change the filter after the first few hours of operation and again at regular intervals as listed in the Operator's Manual. If filters are not replaced as recommended, a build up of debris can block the pores of the filter. Continued operation with a clogged filter can cause damage to hydraulic system components.

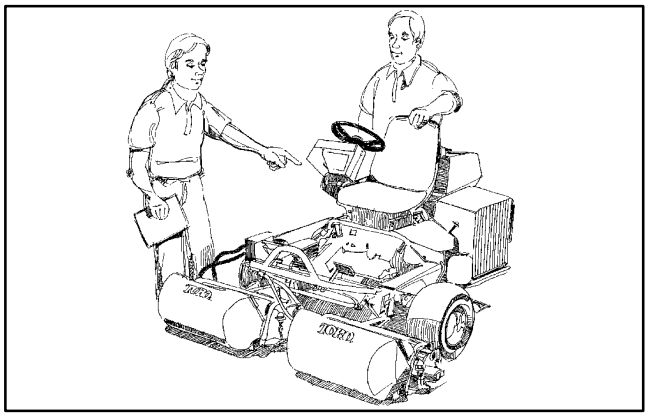
IMPORTANT: Use only Toro replacement filters. These filters have Toro specified filtration ratings and no internal by–pass valve. Using a standard automotive type filter, even though it may fit, will cause damage to the hydraulic system and void the warranty. Other "will fit" filters will often appear similar to Toro filters, but the filter media may not have the same filtration rating.

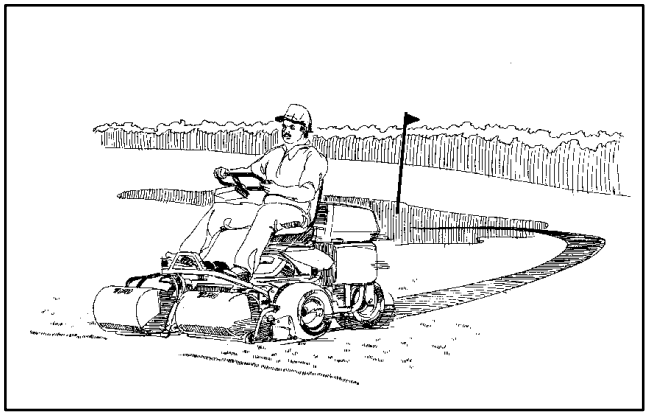
Hydraulic Troubleshooting and Testing

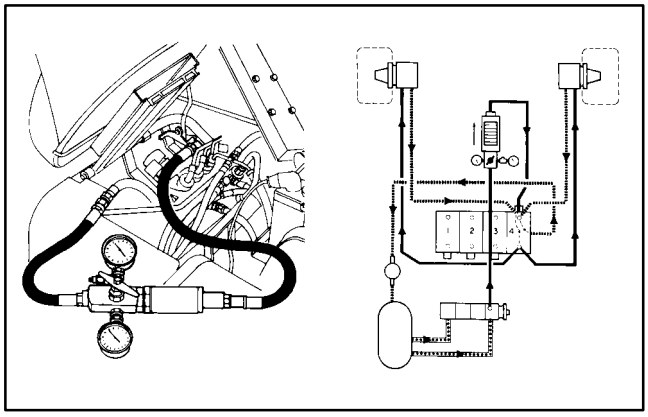
A hydraulic system with an excessive increase in heat or noise is a potential failure. Should either of these conditions be noticed, immediately stop the machine, turn off the engine, locate the cause of the trouble, and correct it before allowing the machine to be used again. Continued use of an improperly functioning hydraulic system could lead to extensive internal damage.

When troubleshooting a hydraulic problem:

1. Know the hydraulic system for the machine:
   - Study the schematics, Operator's Manual and Service Manual.
   - Know how the system works and what the relief valve settings and pump output should be.
2. Talk to the operator:
   - How did the machine act just as it started to malfunction?
   - Was any "do–it–yourself" service performed or did anyone else attempt the repair the machine?
   - How was the machine used and when was maintenance last performed?
3. Operate the machine:
   - Operate the machine in conditions simulating when the malfunction occurred. Verify what the operator described.
   - Are gauges or warning lights operating correctly?
   - Do the controls feel spongy or stick?
   - Check for unusual sounds, smells or smoke. At what speeds or operating cycles does this occur?
4. Inspect the machine:
   - Check the hydraulic fluid level and condition. Is the fluid dirty or filter(s) plugged?
   - Check for overheating. Does the oil have a burnt odor? Is the oil cooler plugged or lines caked with dirt?
   - Look for bent or or collapsed fluid lines. Check for leaks, loose fasteners, cracked welds, binding pivot points, damaged linkage, etc.
5. List possible causes:
   - Note what was reported by the operator and verified by you.
   - List what you found during your inspection.
   - Remember that there may be more than one cause leading to the failure or malfunction.
6. Determine which cause is most likely the problem:
   - Look at your list of possible causes and determine which are the most likely. Use the troubleshooting charts in your Service Manual.
7. Test your findings:
   - Operate the machine with a hydraulic tester connected to the suspected malfunctioning circuit.
   - It may be necessary to replace or adjust a component to verify your findings.







Removing Hydraulic System Components

1. Thoroughly clean the machine before disconnecting, removing or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment.

2. Put caps or plugs on any hydraulic lines or fittings left open or exposed.

3. Put labels on disconnected hydraulic lines and hoses for proper installation after repairs are completed.

After Repair or Replacement of Components

1. Check oil level in hydraulic reservoir and add correct oil if necessary.

IMPORTANT: Drain and refill hydraulic system reservoir and change oil filter if component failure was severe or system is contaminated. If there is a severe failure in a closed loop system, flush all lines, fittings and components in the system.

2. After repairs, check control linkage for proper adjustment, binding or broken parts.

3. After disconnecting or replacing any hydraulic components, operate machine functions slowly until air is out of system.

4. Check for hydraulic oil leaks. Shut off engine and correct leaks if necessary. Check oil level in hydraulic reservoir and add correct oil if necessary.

The most important rule of hydraulic system maintenance is . . .

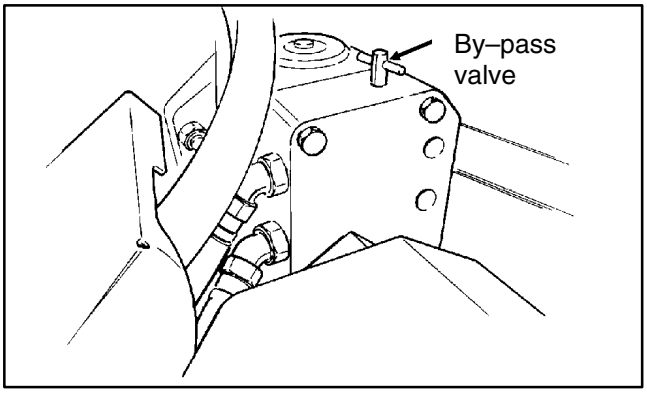
KEEP EVERYTHING CLEAN !

Towing Machines with Hydrostatic Transmissions

It is important to remember that most Toro Commercial Products are equipped with hydrostatic transmissions. Pushing or towing these machines can cause damage to the transmission. Most hydrostatic transmissions are equipped with a bypass valve, that if opened, allows the machine to be pushed or towed a short distance.

IMPORTANT: Do not push or tow the machine faster than 2–3 mph (3–4.8 km/hr) because internal transmission damage may occur. The by–pass valve must be open whenever the machine is pushed or towed.

IMPORTANT: Running the engine with the by–pass valve open will cause the transmission to overheat.



Use of Biodegradable Hydraulic Fluid

Mobil EAL 224H is the only qualified readily biodegradable type oil approved for use in Toro Products. Other oils have not been evaluated and may or may not perform the same. Toro has tested and approved a number of products for use with biodegradable hydraulic fluids:

Greensmaster 3050
Greensmaster 3100
Greensmaster 3200/3200–D/3250–D (optional oil cooler recommended)
Reelmaster 2300–D/2600–D
Reelmaster 3100–D
* Reelmaster 223–D/5100–D/5300–D/5200–D/5400–D/5500–D
Reelmaster 6500–D/6700–D

*** IMPORTANT: DO NOT use biodegradable oil in applications where the differential housing is the oil reservoir (Reelmaster 223–D / 5100–D / 5300–D / 5200–D / 5400–D / 5500–D). This oil does not contain the lubrication properties necessary for a ring gear and pinion.**

IMPORTANT: Flush the hydraulic system when changing from petroleum base hydraulic fluid, such as Mobil 424, to biodegradable fluid, such as Mobil EAL 224H. Operate the machine under normal operating conditions for at least four (4) hours before draining.

1. Lower cutting units, stop engine, engage parking brake and remove key from ignition switch.

2. Drain the system, including cylinders, hoses and tube lines while system is warm.

3. Inspect and clean reservoir.

4. Replace hydraulic filter.

5. Fill hydraulic reservoir. NOTE: Use biodegradable fluid, such as Mobil EAL 224H, for this step if you are changing to this type of fluid. Use only hydraulic fluids specified. Other fluids could cause system damage.

6. Disconnect fuel stop solenoid electrical connector (Diesel engine) or spark plug wires (gas engine) to prevent engine from starting.

7. Turn ignition key switch to engage starter for ten (10) seconds to prime pump. Repeat this procedure again.

8. Connect fuel stop solenoid electrical connector or install spark plug wires.

9. Start engine and let idle at low speed for minimum of two (2) minutes.

10. Increase engine speed to high idle for minimum of one (1) minute under no load.

11. Turn steering wheel fully left and right several times (if equipped with power steering).

12. Raise and lower cutting units several times.

13. Shut off engine and check for hydraulic oil leaks. Check oil level in hydraulic reservoir and add correct oil if necessary.

14. Operate the machine for two (2) hours under normal operating conditions.

15. If the flushing fluid shows any signs of contamination, or if you are changing to biodegradable fluid, do steps 1 – 13 again.

16. Assume normal operation and follow recommended maintenance intervals.

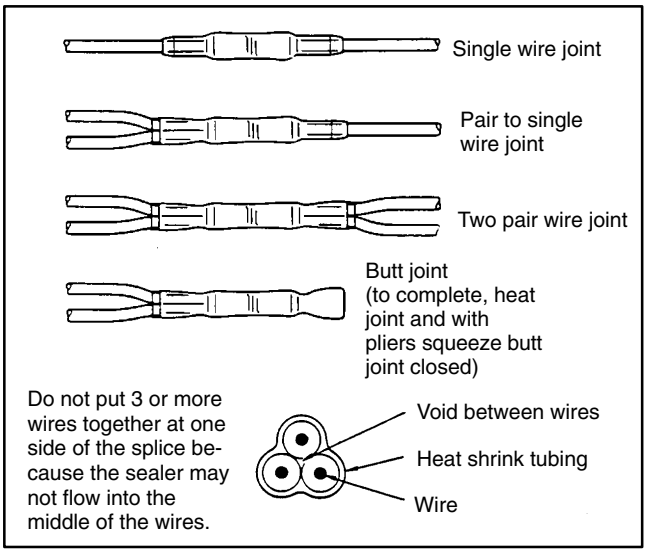
Wiring Repairs

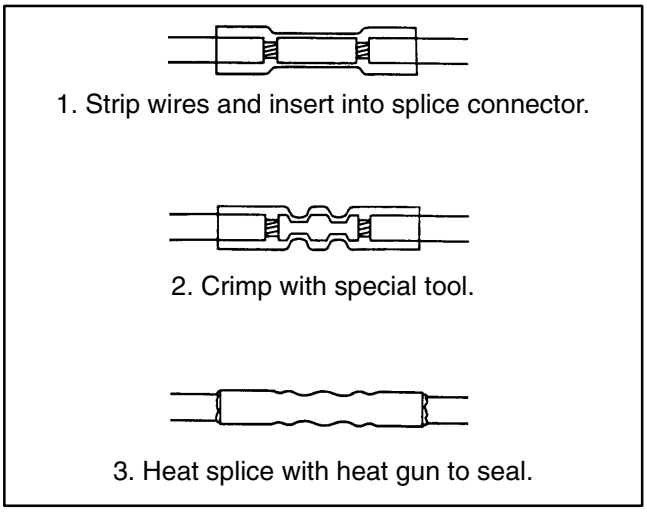
Toro recommends the use of sealed connections when making wiring repairs on turf maintenance equipment, especially machines with electronic controllers. Because of the severe conditions that turf maintenance equipment operate in, resistance to corrosion and the durability of the connection are very important.

Heat shrink, solderless crimp connectors, such as Alpha Fit–Crimp, Molex–BTC Perma–Seal, and 3M Scotchlok have many advantages:

- Fast, positive connection with hand actuated tools.
- Built–in strain relief.
- Few tools required.
- Sleeve and connector in one assembly.
- Double walled sleeve seals out corrosion.
- Greatly enhanced strain relief over standard crimp splices.

The splices are made of heat shrinking nylon tubing with a sealer coating the inner wall. To install, crimp the wires first with the proper tool, then use a heat gun to seal the splice. You must make sure you have a good crimp, since this will assure a strong durable splice. When this splice is made using a good crimper and heat gun, the repair will be stronger than the wire itself.


Single wire joint
Pair to single wire joint
Two pair wire joint
Butt joint (to complete, heat joint and with pliers squeeze butt joint closed)
Do not put 3 or more wires together at one side of the splice because the sealer may not flow into the middle of the wires.
Void between wires
Heat shrink tubing
Wire

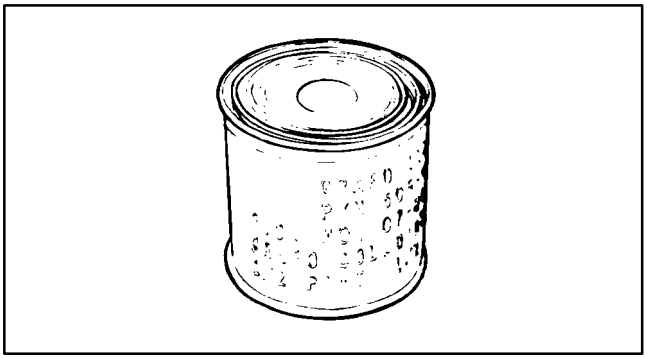


Keep Electrical Connections Dry

Be careful when washing the machine. Use compressed air, not water, to clean under control panels or other areas where electrical connections can remain wet and cause corrosion.

A special non–conductive grease is available to protect exposed electrical connections. This grease forms a light protective skin to help make electrical switches and contacts water resistant.

Skin–over grease Part No. **505–47** 8 oz. (.24 L) can



Electrical Troubleshooting and Testing

Studying the operating characteristics preceding an electrical failure can help identify the malfunction. Try to isolate the failure to a specific functional circuit; then check that circuit. Attempting to repair two circuits at once will lead to confusion.

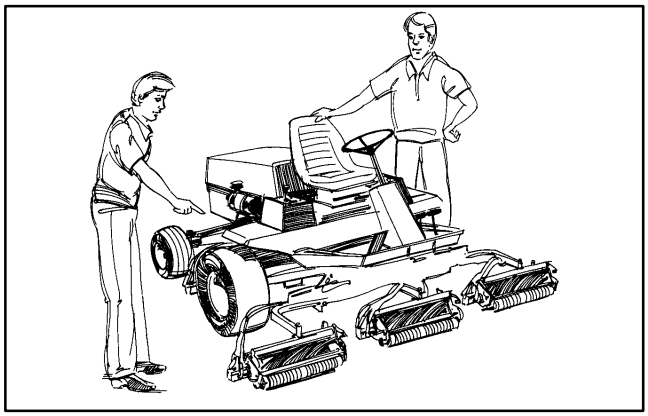
Tools, such as a Volt/Ohm multi–meter, and the ACE Diagnostic Tool, will help you find problems in the circuitry. Remember, most electrical problems are simple, such as a loose connection, rather than mysterious and complex.

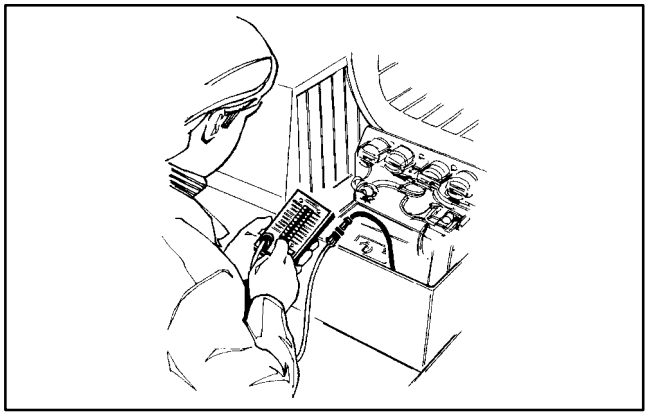
When troubleshooting an electrical problem:

1. Know the electrical system for the machine:
   - Study the schematics, Operator's Manual and Service Manual.
   - Know how the system works and where the interlock switches and other components are.
2. Talk to the operator:
   - How did the machine act when it malfunctioned?
   - Was any "do–it–yourself" service performed or did anyone else attempt the repair the machine?
   - How was the machine used?
3. Operate the machine:
   - If possible, operate the machine in conditions simulating when the malfunction occurred. Verify what the operator described.
   - Are gauges or warning lights operating correctly? Check with the key switch in the ON position, then with the machine running.
   - Do the interlock circuits work properly? (i.e., machine should not start with traction pedal out of neutral, etc.)
4. Inspect the machine:
   - Verify that no interlock switches are bypassed.
   - Check all wiring connections.
   - Look for corrosion and broken or bare wires.
   - Check for overheated components or wiring.
5. List possible causes:
   - Note what was reported by the operator and verified by you.
   - List what you found during your inspection.
   - Remember that there may be more than one cause leading to the failure or malfunction.
6. Determine which cause is most likely the problem.
   - Look at your list of possible causes and determine which are the most likely. Use the troubleshooting charts in your Service Manual.
7. Test your findings.
   - Check the suspected circuit(s) or switch(s) with a continuity tester or digital Volt/Ohm multi–meter.
   - It may be necessary to replace or adjust a component to verify your findings.

CAUTION

If the machine being repaired has any interlock switches by–passed, they must be reconnected for proper troubleshooting and safety of operator and bystanders.





Inspecting and Sharpening Rotary Mower Blades

Rotary mowers cut grass by the blade's cutting surface impacting against the grass stems at a high velocity. To assure good quality of cut, the cutting edge of the blade must be kept in a sharp condition. A dull blade will produce a ragged cut and will require an excessive amount of engine horsepower to rotate the blade through the grass. The most common causes for rotary mowers not giving a good quality of cut are due to dull cutting edges and/or bent blades.

Whenever a blade is removed for sharpening:

A. The blade must be checked to assure that it is not bent and has the correct attitude in relation to the housing and ground surface.

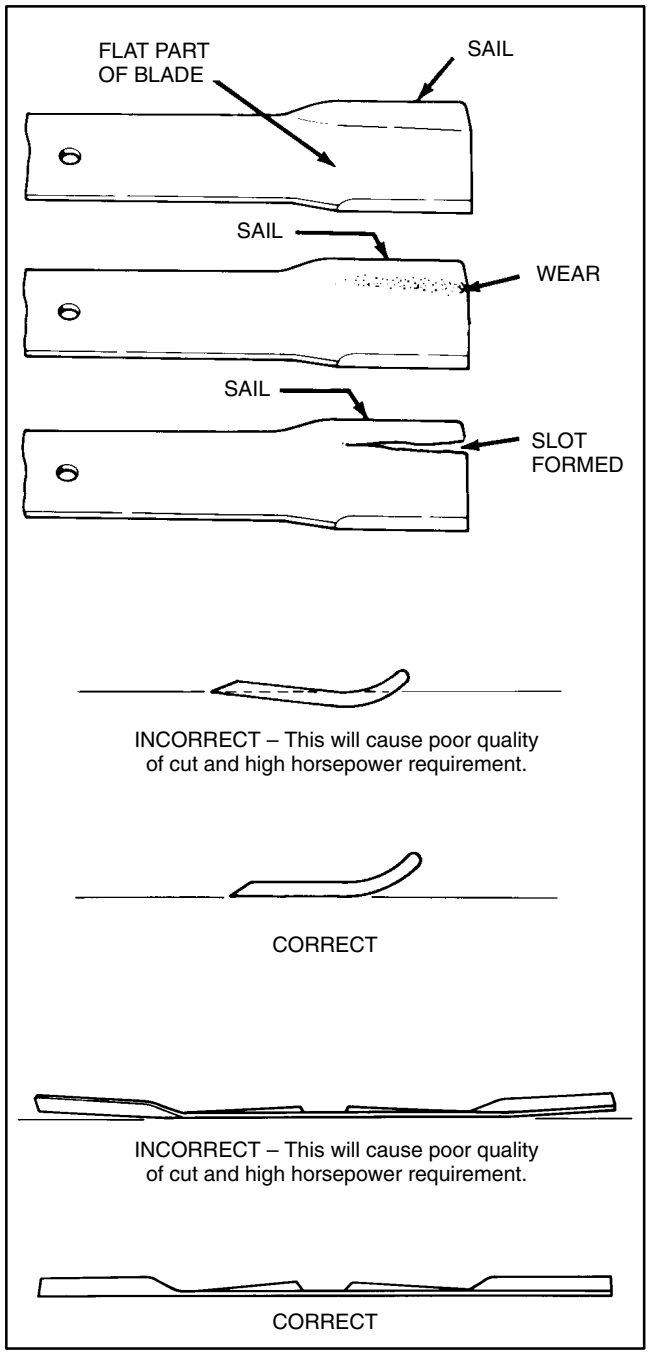
B. The blade must be sharpened correctly.

C. The blade balance must be checked each time the blade is sharpened.

D. When installing the blade, it is very important that the blade retaining bolt or nut be tightened to the correct torque so it will not loosen during operation.

WARNING

If blade is allowed to wear, a slot will form between the sail and flat part of the blade. Eventually a piece of the sail may break off and be thrown from under the housing, possibly resulting in serious injury to yourself or a bystander.



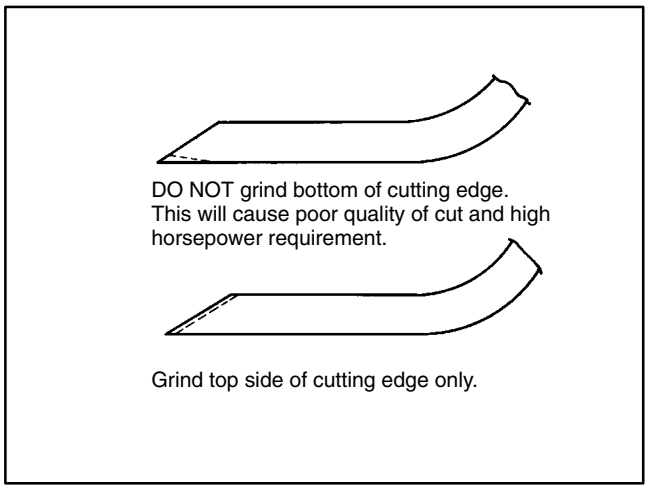
Sharpening Process

Before sharpening the blade, check to make sure it is straight. Lay the blade on a flat surface to check.

CAUTION

Do not try to straighten a blade that is bent, and never weld a broken or cracked blade. Always use a new TORO blade to assure continued safety certification of the product.

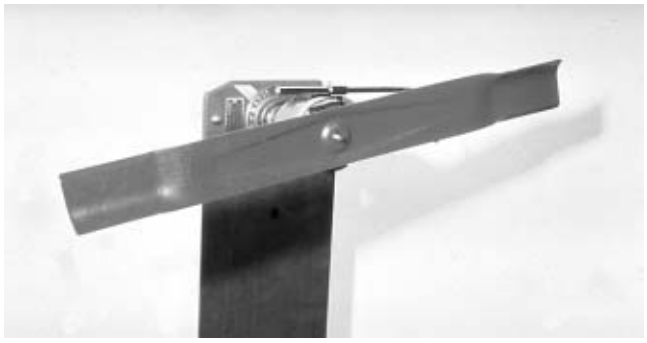
When sharpening the blade, grind the top surface only, trying to maintain the angle of the original cutting edge. Do not grind the bottom surface or a chisel shape will result. The lowest portion on the blade that contacts the grass must be the cutting edge or the grass will not be cleanly cut and excessive horsepower will be required.


DO NOT grind bottom of cutting edge.
This will cause poor quality of cut and high horsepower requirement.
Grind top side of cutting edge only.

WARNING

To prevent possible personal injury, wear a face shield or safety glasses when grinding or sharpening is being done.

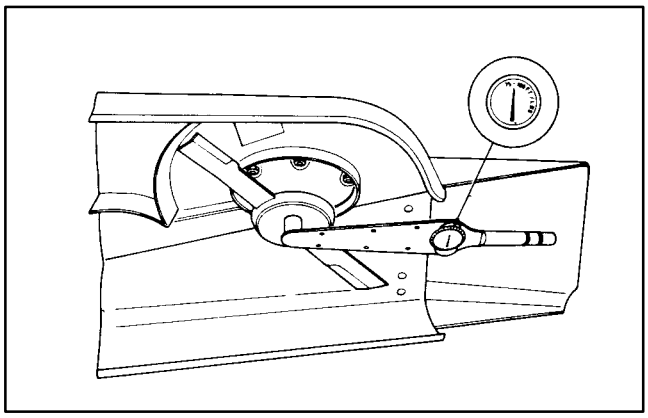
After the blade has been sharpened, check the balance. This can best be done by using a blade balancer tool. A balanced blade will stay in a horizontal position on the balancer. A blade that is not balanced will settle to the heavy side. If the blade is not balanced, grind some metal off the heavy end of the blade.



Blade Bolt Torque

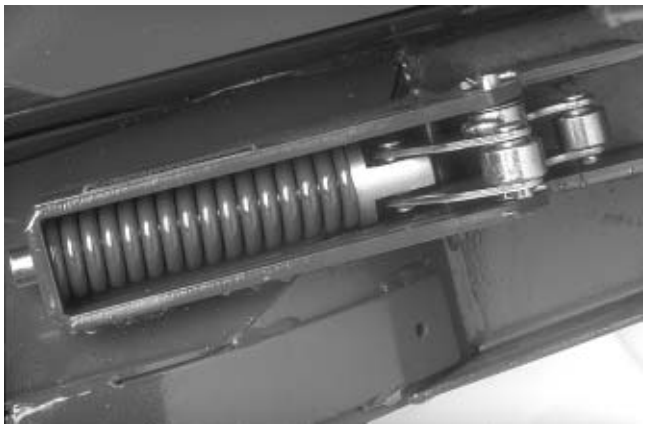
When installing blades, be sure to tighten the blade retaining bolt to the proper torque. Do not use an air or electric wrench to apply the final torque. To prevent loosening or damaged threads, always use a standard torque wrench to apply the final torque.

Check blade retaining bolt torque any time a blade has hit a solid object.



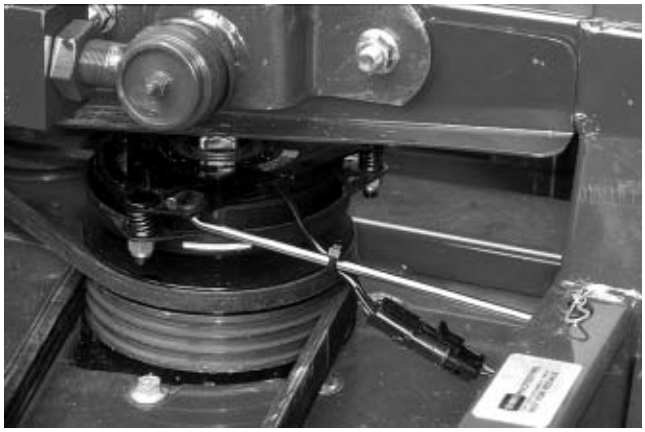
GROUNDSMASTER 455: Wing Decks Break Away Easily

If a wing deck does not latch properly when lowered, the deck may break away easily (i.e., while moving forward on level ground or if an undulation is encountered). The most common cause for this occurrence is debris getting packed into or around the latch assembly. To correct this problem periodically clean the area with compressed air and lightly lubricate the latch mechanism and tension spring.



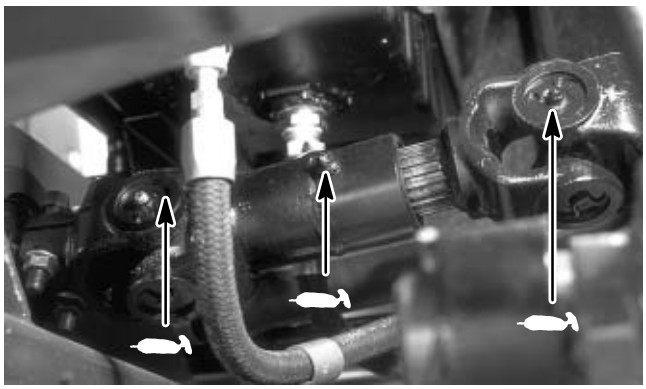
GROUNDSMASTER 455: Wing Clutch Bearings

The electric clutches on the wing decks generate heat during operation. If the area under the deck covers is washed with water immediately after operating, the clutches and idler pulleys cool down at a fast rate, which can cause water to get pulled past the seals into the bearings. This can cause early bearing failure in the clutches and idler pulleys. It is suggested that the inside area under the deck covers be cleaned with compressed air instead of water.



GROUNDSMASTER 580: Drive Shaft Lubrication

The hydraulic transmission drive shaft has three (3) grease fittings that require lubrication every 50 hours of operation. Use No. 2 general purpose lithium or molybdenum base grease. Failure to lubricate regularly can cause drive shaft failure resulting in oil cooler, radiator and engine crankshaft damage.



Reel Mowers

Quality of Cut

There are many factors that can affect quality of cut, including condition of the mowing equipment and agronomic factors. Turf conditions such as excessive thatch, “sponginess” or attempting to cut off too much grass height may not always be overcome by adjusting the machine. It is important to remember that the lower the height of cut, the more critical these factors are.

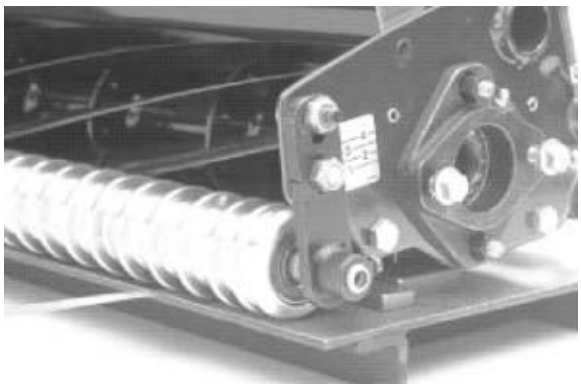
Remember that the “effective” or actual height of cut depends on cutting unit weight, cutting unit accessories and turf conditions. Effective height of cut will be different than the bench set height of cut.

Factors That Affect Quality of Cut

Tire pressure
Engine governed speed
Reel bearing condition/adjustment
Reel and bedknife sharpness
Bedknife parallel to reel
Bedknife to reel contact
Bedknife attitude (angle)
Roller(s) parallel to reel
Height of cut
Correct bedknife
Cutting unit alignment and ground following
Roller and roller bearing condition
Reel speed
Traction speed
Cutting unit drop speed and sequence
Cutting unit counterbalance or downpressure setting

Cutting Unit Set–up and Adjustment

Reel mower performance depends on proper set–up and adjustment procedures. An error of .010 of an inch (.25 mm), in height end–to–end, or from one cutting unit to another, is visible as a mismatch on many golf course greens. Although there are design variations in cutting units, most require the same basic procedures. A surface plate, accurate height–of–cut tools and proper instruction are essential for setting up a cutting unit.

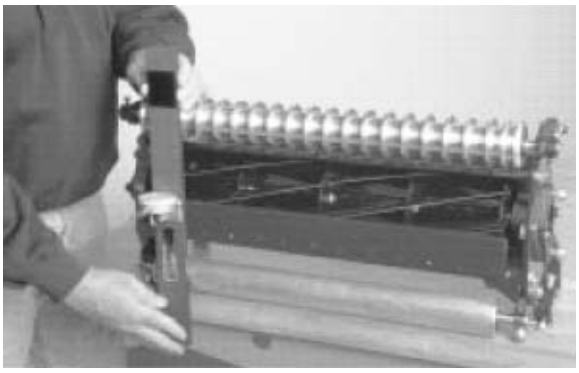


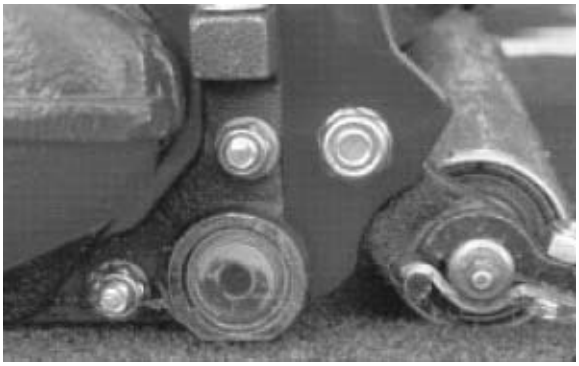
Bench Set Height–of–Cut

Prior to setting up a cutting unit, the term “height–of–cut” and how it relates to performance must be understood.

In the maintenance shop, a setting is done measuring height–of–cut from a hard, level surface to the cutting edge. This is called “bench set” height–of–cut. This height is normally chosen through experience. It factors in turf conditions, seasonal changes, and playability requirements.

Keep in mind that two similar cutting units of the same or different manufacturers can be bench set the same but may cut at different effective heights due to a configuration difference (i.e., weight, rollers, attitude etc.).





Effective Height–of–Cut

This is the actual height the grass has been cut. Making an accurate height measurement on the turf is difficult due to many variables. A true base is simply not present. If the surface is uneven, spongy or varies in density, color variations in the turf may appear in the form of a streak. This is due to the effective height–of–cut being too low for the existing turf conditions. To correct problems, start or change a cultural practice, change cutting unit configuration or raise the bench set height–of–cut. The lower your height–of–cut, the more predictable and smooth the turf surface must be.

Maintaining Height–of–Cut and Performance

To accurately maintain height–of–cut and performance, routinely check the following components:

Reel Bearings: Check for play and roughness. Replace if necessary. If adjustable, adjust to “no“ lash while maintaining free rotation of the reel.

Bedknife to Reel Adjustment: Before performing any set–up procedures, it is critical that the reel and knife cutting edges are straight and sharp. Lap or grind as necessary. Adjust as needed to ensure the knife and reel contact their full length with LIGHT contact and free–reel rotation.

Attitude Adjustment: If the unit has this capability, set for height–of–cut used.

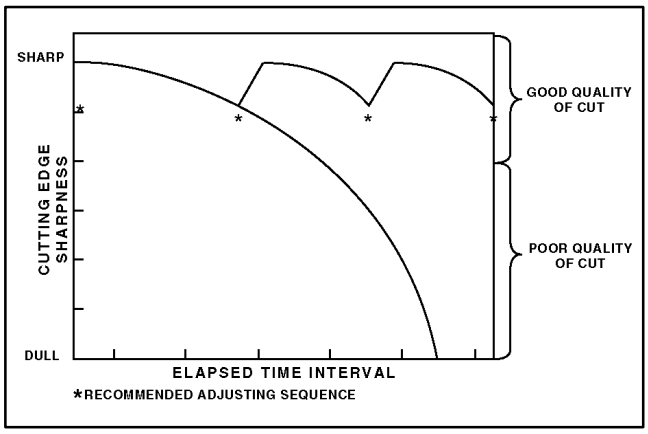
Roller Parallelism: Check for loose roller bearings. Adjust or replace as necessary. First parallel the front or rear roller, which ever is not used for setting height–of–cut. This paralleling roller is set to match the reel using a surface plate–type fixture.

Height–of–Cut: Set to desired height using an accurate tool. This procedure must be done exactly the same on each cutting unit. NOTE: As reel cutting unit design and configuration continue to evolve, height–of–cut settings may need modifying to retain visual and playability goals.

Bedknife to Reel Adjustment

Properly adjusting the bedknife to the reel is one of the most effective preventive maintenance practices for reel mowers. The amount of contact and how frequently it is checked are major factors in performance. A light contact adjustment, if maintained, will help keep cutting edges sharp on the reel and bedknife. This requires that the adjustment be checked frequently at a predetermined time interval. Dulled cutting edges cannot be corrected immediately by adjustment or over–tightening. Do not wait until the quality of cut has deteriorated to check the adjustment.

NOTE: If the cutting edges on the reel blades and bedknife are not straight and sharp the results may not be acceptable. This is true even if all other set–up procedures are correct.



When to Sharpen

Cutting units should be kept as sharp as possible to:

- Promote growth of healthy grass.
- Optimize cutting unit performance.
- Extend the life of the mower.
- Maximize operator mowing time.
- Allow the tractor to run most efficiently.
- Provide excellent finished appearance of the turf.

How can you tell if sharpening is necessary?

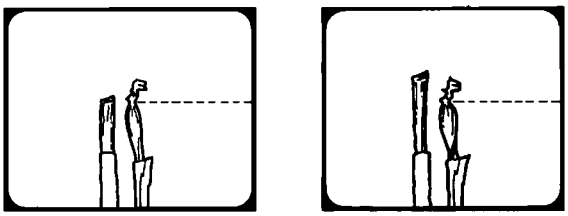
- The grass is not cut cleanly
  – Streaks.
  – Stragglers.
- The cutting unit is noisy.
- “Its that time of year”.

One sure way to determine the answer to this is by actually checking the cutting edges of the reel and bedknife to see if they are dull, nicked, bent or being run without light contact against one another.

A grooved or wavy (rifled) reel or bedknife is most often caused by operating the cutting unit with heavy bedknife to reel contact. This condition can only be corrected by grinding the reel and bedknife – BACKLAPPING WILL NOT CORRECT THIS CONDITION.

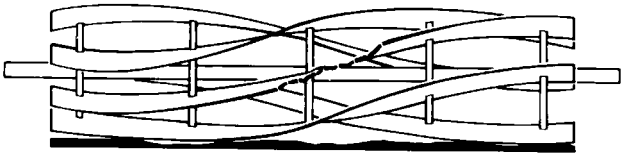
Reel blades, and the edge of the bedknife, should be checked for damage visually and by carefully feeling the edges. Of course, this should only be done when it is certain that the reel cannot be started,. and never slide your fingers down the edges lengthwise.

Rounded edges on the reel blades and bedknife will cause the grass blades to be pinched and torn, rather than sheared off cleanly. When light contact is not maintained, dull edges will soon result.

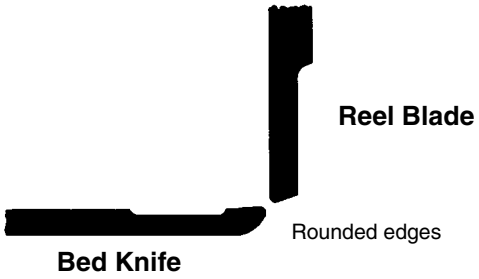


3 hours after cut 24 hours after cut

Effect of sharp versus dull cut on growth rate on two nearly identical blades of Bluegrass (sketched from actual time–lapse photos).

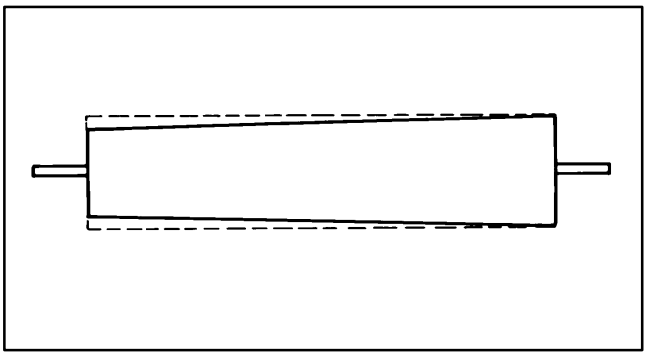


Streaks will appear on the low areas of a grooved or wavy (rifled) bedknife



Sharpening will also be required if the reel is “cone shaped” (tapered).

All reels eventually become tapered with use. If the reel is not adjusted or ground to a cylinder shape again, a mismatch in the height cut between adjacent reels can result.



Sharpening Methods

There are several methods that may be used to sharpen a cutting unit. The one that you choose will depend upon the condition of the cutting unit. It should also make the most sense for the anticipated use. For example, if you are about to mow greens that have been core aerated and topdressed, you may not want to grind the reels and install new bedknives.

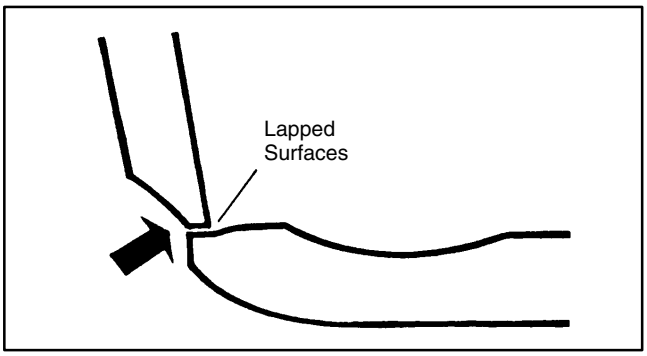
Sharpening Methods

1. **Maintain proper ADJUSTMENT.**
2. **BACKLAP the reel and bedknife.**
3. **GRIND the reel and bedknife.**

Backlapping

Lapping must be done after single blade grinding. This is done to establish a “land area” and to insure a perfect match between the bedknife and the reel edge.

Lapping is not intended to be a reconditioning process to correct severely nicked or rounded blades, rifling or taper. If, after 5 minutes of lapping, the edge is not restored, it is time to grind the reel.

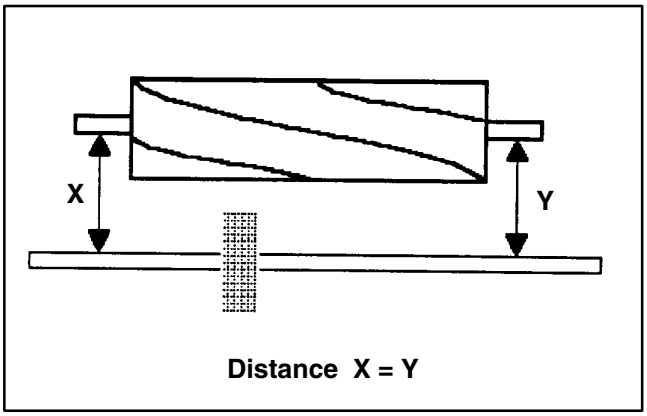


WARNING

Always use a brush with an extended handle to apply the lapping compound to the rotating reel. Using a short handle brush could cause your hand to be pulled into the reel, and cause serious injury. Keep your hands, feet and clothing away from moving parts!

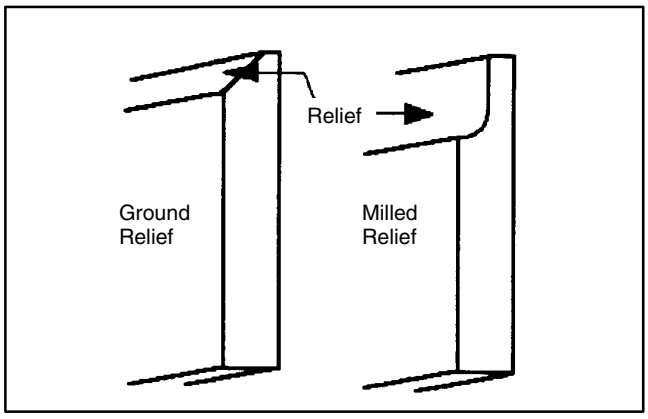
Proper Alignment Before Grinding

Before a reel can be sharpened correctly, the reel has to be prepared (cleaned, check for loose blades, etc.). The reel bearings must be in good condition, with no end play evident. Make sure the cutting unit frame and roller brackets are true and not bent or damaged from impacts with trees, posts or cart path edges. The cutting unit must be aligned so the grinding wheel will travel parallel to the reel shaft. This will result in the the reel being ground to the desired cylinder shape.



Distance X = Y

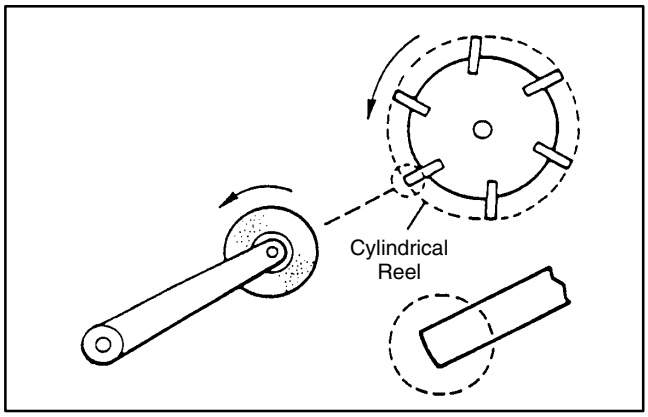
Different Types of Reel Blades



It is important to understand that Toro reel mowers are designed and manufactured to optimize available power from the engine and hydraulic systems. To help do this, we put a “relief” on every reel blade to reduce the width of reel blade that contacts the bedknife. This has been proven to reduce power requirements, as well as allow the machine to operate more efficiently. This can be very important, depending on the terrain, type of grass and amount of grass being cut.

Toro has two different methods of manufacturing reel blades with a “relief”. The reel blades are made from straight stock steel and then are either relief ground or the relief is milled in. Either way, there is a relief on the blade when it is manufactured. NOTE: A small ground relief is also put on milled relief blades during manufacture.

Spin Grinding (also know as “**Flat Grinding**”)



With this method, both the reel and the grinding stone are turning as the reel is being sharpened. It is often stated that backlapping is not required after spin grinding, because the reel is a perfect cylinder when grinding is completed. This depends on proper alignment of the reel in the grinder before sharpening. Also, the bedknife and bedbar must be straight and perfectly parallel to the reel when it is mounted. Backlapping will remove burrs and rough edges, producing a honed edge that will cut grass evenly.

NOTE: If using a spin grinder to sharpen straight stock reel blades (such as on fairway mowers) some or all of the relief will be ground off (see Different Types of Reel Blades above). If you are going to restore the relief that was on the blade when was manufactured, you will need to also use the other method of grinding (single blade “relief” grinding). Do the relief grinding first, then spin grind to restore the reel to a cylinder shape.

Single Blade Grinding (also know as "**Relief Grinding**" or "**Back Grinding**")

Toro recommends a 30° relief angle on each reel blade. The angle itself is not critical. You can put as little or as much angle on the blade as you think is proper. A larger angle will take off more steel and the reel will have to be replaced sooner. With a smaller angle, you may have to grind the reel more often.

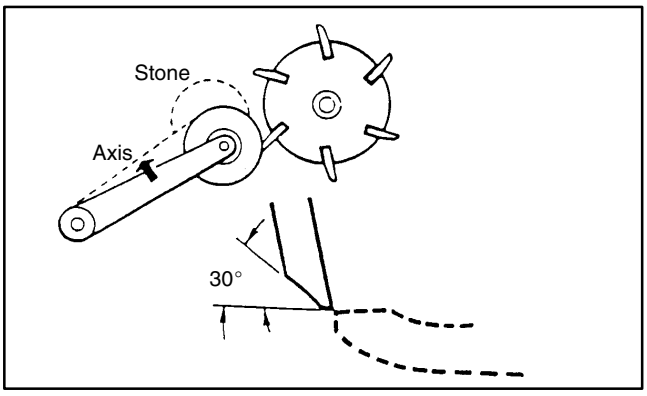
CAUTION

To prevent possible personal injury, always wear a face shield or safety glasses when grinding or sharpening is being done.

It is a good idea to follow a blade grinding sequence during the process so that the reel ends up as close to a cylinder shape as possible. This will reduce the amount of backlapping needed after grinding is completed.

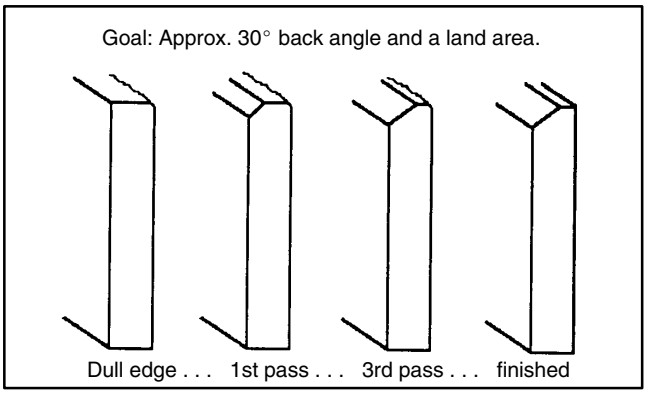
The numbers shown in the illustration indicate one example of the sequence that may be used. Remember that a final grind in a spin grinder, or some backlapping will get the reel into a true cylindrical shape.

It will normally take several passes across each reel blade to renew the sharp edge and remove the taper from the reel. This example may have required 4 or 5 passes and then was completed with a backlapping job to create the land area. NOTE: It is acceptable practice to grind in both directions across the blades.



Sequence for a 5 Blade Reel
START END

1 – 2 – 3 – 4 – 5 – 1
2 – 3 – 4 – 5 – 1 – 2
3 – 4 – 5 – 1 – 2 – 3
4 – 5 – 1 – 2 – 3 – 4
5 – 1 – 2 – 3 – 4 – 5
. . . and so on until finished.



Bedknife Replacement and Grinding

1. Remove bedbar from cutting unit.

2. Remove bedknife screws and remove bedknife.

3. Remove all rust, scale and corrosion from bedbar surface before installing new bedknife.

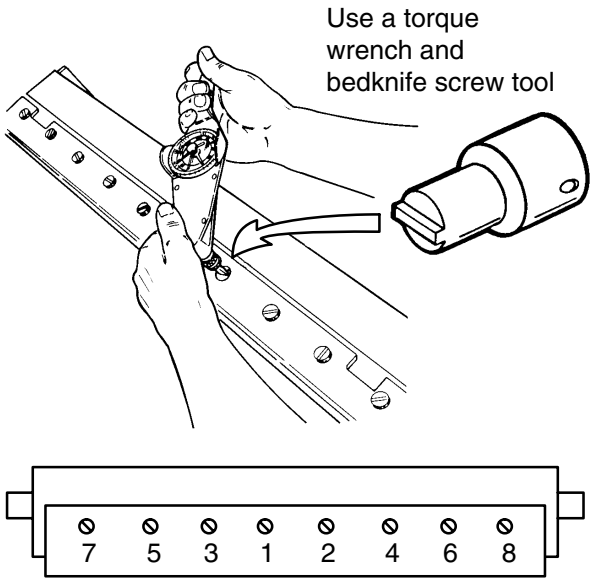
4. Install new bedknife:

   A. Make sure bedbar threads are clean.

   B. Use new Toro screws. Apply anti–seize lubricant to screw threads before installing.

   C. Tighten the screws working from the center toward each end of the bedbar. DO NOT use an impact wrench.
   Fairway/utility mowers: 250 – 300 in.lb. (288 – 345 KgCm)
   Greensmowers: 200 – 250 in.lb. (230 – 288 KgCm)

5. Since there can be variations in the mounting surface of the bedbar, a new bedknife may not be perfectly flat after it is installed. Because of this, it is necessary to backlap or grind a new bedknife after installing it to the bedbar. Follow the existing angle that was ground into the bedknife and grind only enough to make sure the top surface is true.

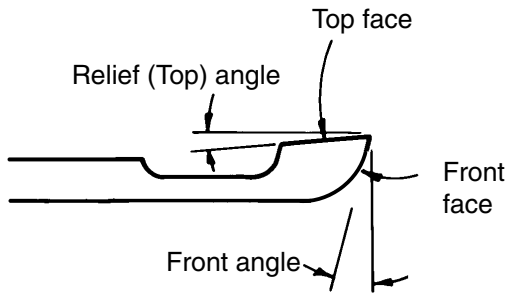


Tighten screws with a torque wrench starting in the center of the bedknife and working your way out.

Regrinding Bedknife

Remove bedbar / bedknife assembly from cutting unit before attempting to grind a used bedknife. Keep the bedknife fastened to the bedbar when grinding.

Note: When grinding, be careful to not overheat the bedknife. Remove small amounts of material with each pass of the grinder.



NOTE: Fairway / utility bedknife shown.

See **Toro Reel and Bedknife Grinding Guidelines** chart for specifications.

Preparing Reel for Grinding

See **Toro Reel and Bedknife Grinding Guidelines** charts for grinding specifications.

1. Check to make sure reel bearings are in good condition and properly adjusted before grinding the reel. Make sure the cutting unit frame and roller brackets are true and not bent or damaged from impacts with trees, posts or cart path edges.

2. Remove the bedbar/bedknife assembly.

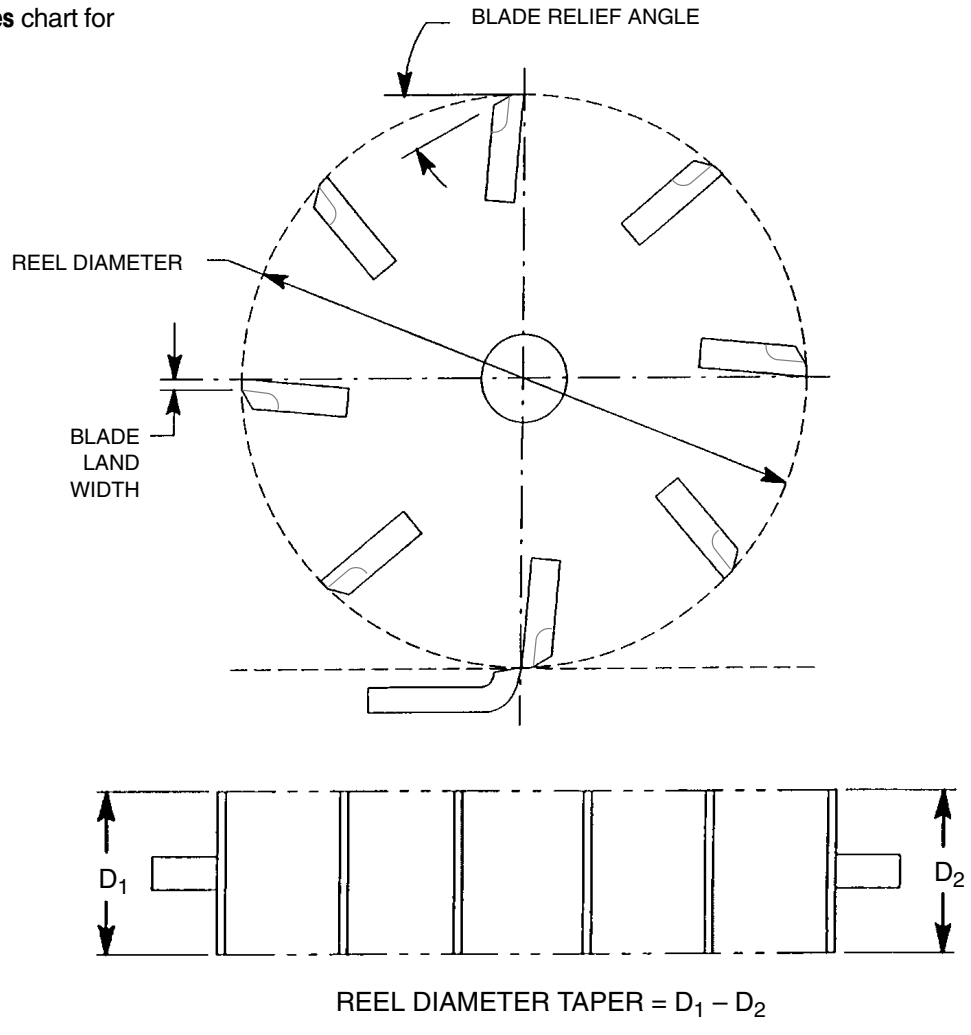
3. Remove parts as necessary to mount the cutting unit in the grinder (e.g., font roller, roller brackets). Follow the grinding equipment manufacturer's instructions for mounting the cutting unit.

Note: The cutting unit must be aligned so the grinding wheel will travel parallel to the reel shaft. This will result in the the reel being ground to the desired cylinder shape.

Note: When grinding, be careful to not overheat the reel blades. Remove small amounts of material with each pass of the grinder.

4. After completing the grinding process, do a complete set–up and adjustment procedure.

See **Toro Reel and Bedknife Grinding Guidelines** chart for specifications.



REEL DIAMETER TAPER = $D_1 - D_2$

Toro Reel and Bedknife Grinding Guidelines					
Characteristic	GR 105, 500	GR 800, 1000, Flex 21, 3000, 3100, 3200, 3050	RM 223, 5100, 5200, 5300, 5400	RM108	RM 216, 2000 2300, 2600, 3100, Grounds Pro 2000
Nominal Reel Diameter	3.5" (88 mm)	5" (126 mm)	5" (126 mm)	7" (178 mm)	7" (178 mm)
Number of Blades	9	5, 8, 11	5, 8	5, 6	5, 8
Service Limit Reel Dia.	3.2" (82 mm)	4.5" (114 mm)	4.5" (114 mm)	6.2" (158 mm)	6.2" (158 mm)
Blade Relief Angle	30°	30°	30°	30°	30°
Relief Angle Range	20° – 40°	20° – 40°	20° – 40°	20° – 40°	20° – 40°
Blade Land Width	.040" (1.0 mm)	.040" (1.0 mm)	.040" (1.0 mm)	.060" (1.5 mm)	.060" (1.5 mm)
Land Width Range	.030 – .060" (.7 – 1.5 mm)	.030 – .060" (.7 – 1.5 mm)	.030 – .060" (.7 – 1.5 mm)	.050 – .090" (1.3 – 2.3 mm)	.050 – .090" (1.3 – 2.3 mm)
Maximum Allowable Reel Diameter Taper	.040" (1.0 mm)	.040" (1.0 mm)	.040" (1.0 mm)	.060" (1.5 mm)	.060" (1.5 mm)
Bed Knife Top Angle	0°	3° *	3° **	5° **	5° **
Top Angle Range	–	–	–	2° – 7° **	0° – 5° **
Bed Knife Front Angle	30°	13°	13° **	30° **	30° **
Front Angle Range	26°–34°	13°–17°	13°–17° **	20°–35° **	20°–35° **

Toro Reel and Bedknife Grinding Guidelines (continued)					
Characteristic	RM 5500, 6500, 6700	TURF PRO HTM 175	SPARTAN RM 11	SPARTAN RM 5 & 7	RM 335, 3500, 450, 4000, 4500
Nominal Reel Diameter	7" (178 mm)	7" (178 mm)	7" (178 mm)	8" (206 mm)	8" (206 mm)
Number of Blades	5, 11	5, 7	11	5, 7	5, 7, 11
Service Limit Reel Dia.	6.2" (158 mm)	6.2" (158 mm)	6.2" (158 mm)	7.2" (182 mm)	7.2" 182 mm)
Blade Relief Angle	30°	30°	30°	30°	30°
Relief Angle Range	20° – 40°	20° – 40°	20° – 40°	20° – 40°	20° – 40°
Blade Land Width	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)
Land Width Range	.050 – .090" (1.3 – 2.3 mm)	.050 – .090" (1.3 – 2.3 mm)	.050 – .090" (1.3 – 2.3 mm)	.050 – .090" (1.3 – 2.3 mm)	.050 – .090" (1.3 – 2.3 mm)
Maximum Allowable Reel Diameter Taper	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)	.060" (1.5 mm)
Bed Knife Top Angle	5°	5°	5°	7°	5°
Top Angle Range	3°–6°	3°–6°	0°–5°	0°–7°	2°–5°
Bed Knife Front Angle	5° ***	15°	30°	30°	30°
Front Angle Range	3°–7° ***	13°–17°	20°–35°	20°–35°	28°–32°

* "Extended" bedknifes: Top angle 7°.

** "Heavy duty" bedknives: Top and Front angle 10° (8°–12°).

*** "Low cut" bedknife: Front angle 30° (29°–32°)

Evaluating Cutting Unit Performance

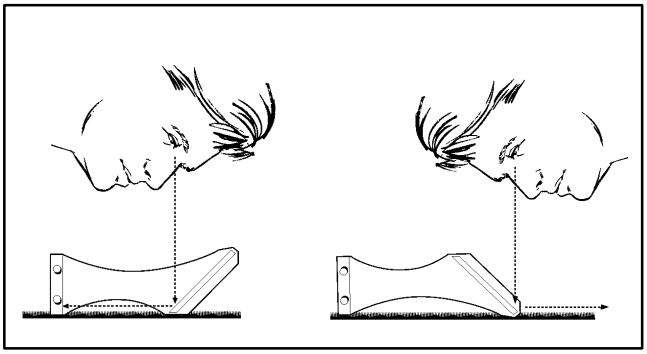
Formal, low–cut turf is evaluated primarily for its visual appearance and functional performance, also called “playability”.

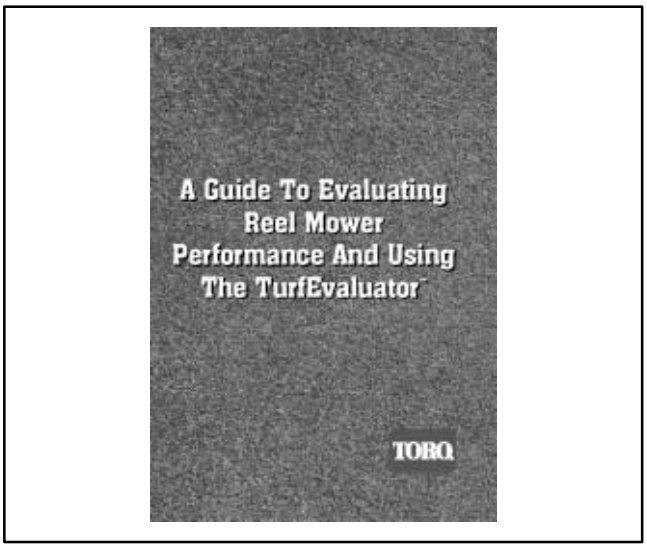
The turf surface can be given a quick evaluation using sight and touch. After mowing, the surface should be firm with a crisp appearance and feel. This can be sensed by placing an open palm against the surface. A crisp, brush–type feel will usually indicate minimal stragglers and an efficient cut. It is normal for the mower to leave after–cut directional light and dark color paths. These overall color paths are due to the turf being rolled down in the direction the mower is traveling. A cut path going away from you will usually be lighter in color than the path coming toward you. Smaller, individual color variations can be due to differing turf types, density variations and straight line mower marks. A spongy area is evident by the momentary impression left by feet on the surface.

Many turf discrepancies are subtle and require closer examination. In these instances, the TurfEvaluator grass viewing tool is helpful. It can assist turf managers in determining causes for poor reel mower performance and comparing the effective height–of–cut of one mowed surface to another.

Turf Evaluator: Model No. **04399**

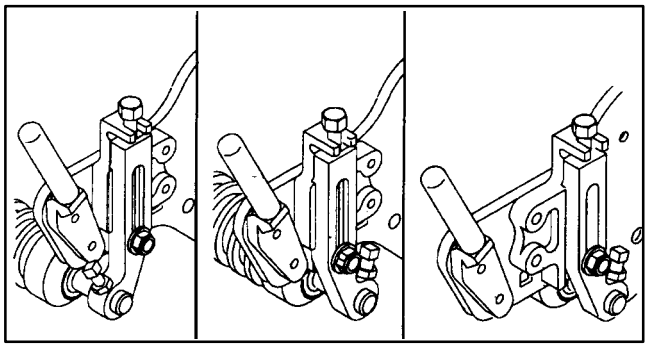
A Guide to Evaluating Reel Mower Performance and Using the Turf Evaluator: Part No. **97931SL**





GREENSMASTER 1000: Front Roller Position

The front roller on the Greensmaster 1000 can be put in 3 different positions depending on the application and needs of the user. The front position is used when a groomer is installed, the middle position is used without a groomer and a third position can be used in extremely undulating turf conditions.



GREENSMASTER 1000: Quality of Cut

If you are having quality of cut problems, making sure the drum is parallel to the reel should be the first step in correcting the problem. This procedure is shown in the Greensmaster 1000 Operator's Manual under LEVELING REAR DRUM TO REEL.

NOTE: When leveling the rear drum to the reel it is important to have a flat and level surface to work on. It is recommended that you use a precision steel plate and a 1/4″ x 1″ flat steel strip approximately 24″ long (6.5 mm x 25 mm x 61 cm long). You can use the the same bench plate used for a Greensmaster 3000 series cutting unit.)

Make sure you are using the correct bedknife for your application. There are three (3) different bedknives available for this cutting unit:

1/8″ (3.2 mm) low cut bedknife
3/32″ (2.4 mm) tournament bedknife (standard)
5/64″ (1.9 mm) micro–cut bedknife

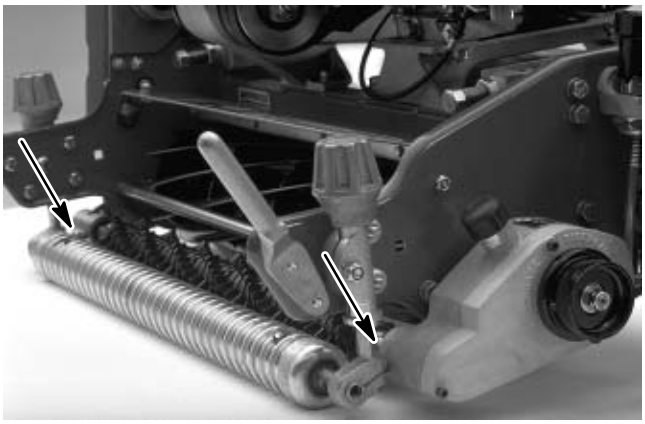
There are several front roller configurations available:

Aluminum Wiehle roller (standard)
Full roller
Swaged roller
Auxiliary roller extension kit

Remember, when selecting rollers, that you will get a lower "effective" height of cut in the turf with a Wiehle roller than with a full roller. Auxiliary roller extensions can help prevent scalping at the ends of the bedknife in severely undulating turf conditions at low heights of cut.

GREENSMASTER 1000: Lubricating Groomer Drive Belt Housing

DO NOT over grease the groomer drive belt housing. Excessive lubrication can actually fill the drive belt housing with grease. Excessive lubrication can prevent the “snubber” cap from properly tensioning the groomer drive belt. Without sufficient tension on the drive belt, the clutch will not engage properly.



REELMASTER 5100/5300/6500/6700: ClipACE Control Settings

1. On some machines there is a switch that must be set to match the number of blades on the cutting units. **NOTE:** Newer machines do not have this switch and must have the proper setting in the TORO PC software. See your Toro Distributor for assistance.

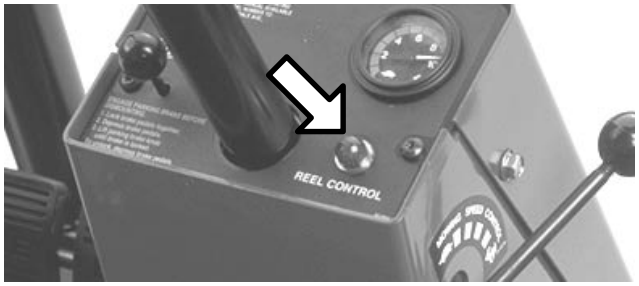
2. The HOC Selector knob must be set to the letter corresponding to the cutting unit height of cut. There are charts located under the seat. These charts are also shown in the Operator’s Manual.

NOTE: The “A” setting is maximum RPM. The cutting unit speed does not vary with ground speed at this setting.

3. The HOC Selector Knob may be set one position on either side of the position indicated on the chart to account for differences in grass condition, grass length removed, and personal preference of the golf course superintendent. For a cut with more grass removed, but slightly more clip visibility, move the HOC Selector Knob one position higher than specified. For a cut with less grass removed and slightly less clip visibility, move the HOC Selector Knob one position lower than specified.

REELMASTER 5100/5300/6500/6700: Reel Control Lamp

ClipACE automatically varies the cutting reel speed within a specific RPM range. This works good for most mowing conditions. It is possible to drive too fast or too slow so that the reel speed cannot be adjusted to match the ground speed. For example, the lamp will be ON when operating the reels with the machine stopped. If the REEL CONTROL lamp comes on during operation, the operator should speed up or slow down until the lamp turns off.

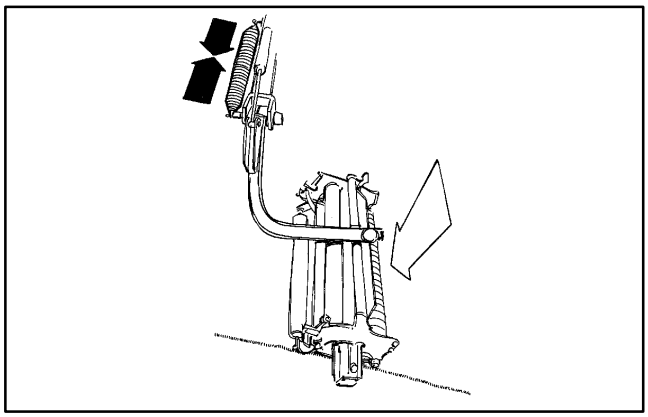


NOTE: On older machines this lamp is located on the side instrument panel.

REELMASTER 223/5100/5200/5300/5400: Cutting Unit Down Pressure Springs

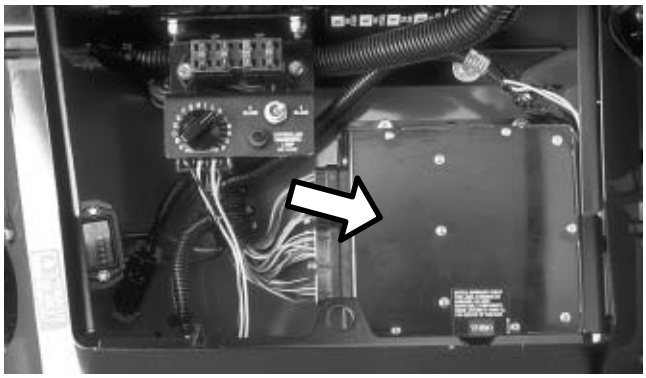
The cutting unit down pressure system can vary the downward force of each cutting unit on the turf. The system has four positions. Each position changes the downward force by 8 lbs. (3.6 Kg). The lightest position equals 110 lbs. (50 Kg). The heaviest position equals 134 lbs. (61 Kg).

Different ground pressures work better than others, depending on the turf and climate conditions.



REELMASTER 223/5100/5200/5300/5400/6500/6700: Reliability of ACE Controller

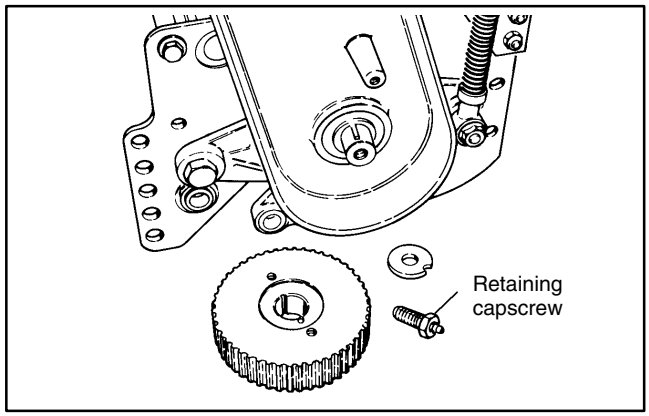
The failure rate of the Toro ACE Controller has been less than one–tenth of one percent. If you think that the controller on your machine is not working properly, check everything else first. If is very likely that the controller is NOT causing the electrical problem.



REELMASTER 335/3500/450/4000/4500: Reel Drive Pulley Installation

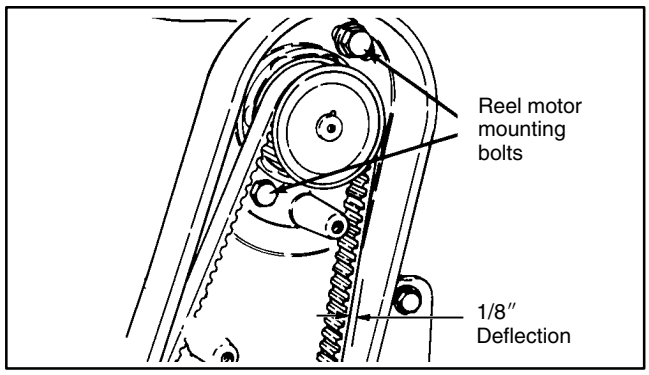
The aluminum reel drive pulley is secured to the reel shaft with capscrew and key. If the capscrew becomes loose, the hardened steel key can wear the key slot in the gear. A gear with a worn key slot should be replaced.

Use Loctite 755 or equivalent cleaning solvent to make sure any grease is completely removed from threads in the reel shaft and on the capscrew. Assemble the reel drive pulley to the reel shaft using Loctite 271 on the threads of the retaining capscrew. Tighten the capscrew to 75 ft–lb (102 Nm). Improper installation will result in pulley and/or reel shaft damage.



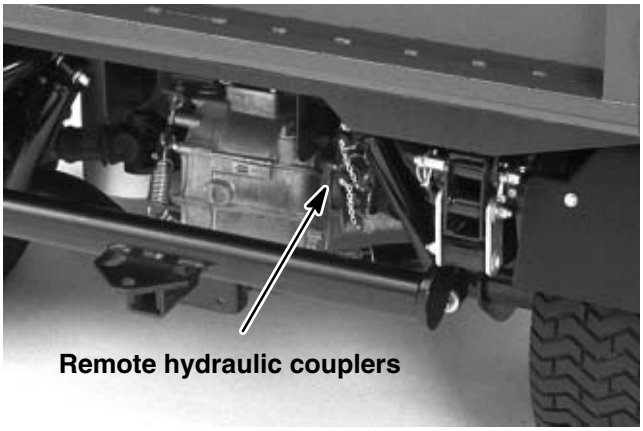
DO NOT over–tighten the belt; this can cause reel motor shaft seal leakage and additional stress on the reel shaft drive pulley. Correct belt tension is 1/8″ (3 mm) deflection at the mid–point when 7 lbs. (3 Kg) of force is applied. To adjust belt tension, loosen the reel motor mounting bolts and turn the motor by hand. DO NOT put a bar between hose fittings on the motor to tighten the belt. After adjusting, tighten the reel motor mounting bolts to a torque of 25 ft–lb (34 Nm).

NOTE: Debris inside the belt housing can also cause problems and damage. Check to make sure the plug is installed in the inspection hole on the cover.



WORKMAN: Hydraulic System

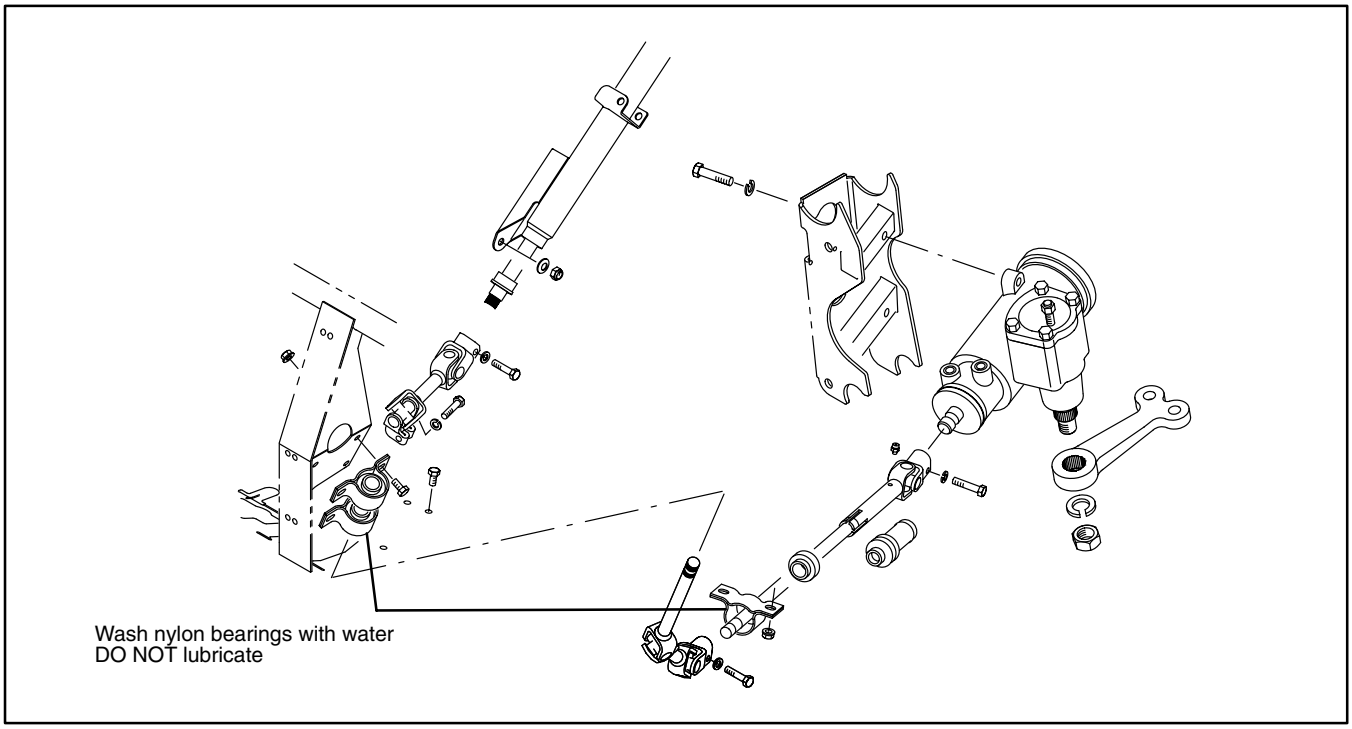
The Workman uses **Dexron III ATF** as the transaxle/hydraulic fluid. When coupling an attachment to a Workman remote hydraulic system, make sure the attachment's hydraulic system is using fluid that is compatible with Dexron II. If in doubt, flush the system before using on the Workman.



WORKMAN: Steering Linkage Service

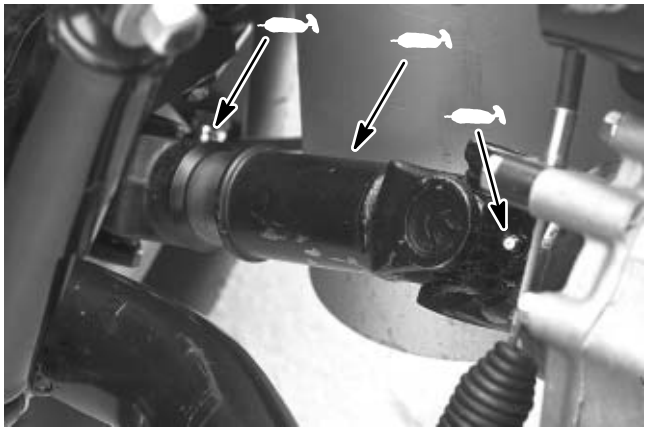
If the steering is binding or turning hard, check the nylon bearings in the steering linkage. If the bearings have excessive dirt and debris build–up, rinse them off with water. The water will clean the nylon material and reduce steering effort. DO NOT put lubricant on the nylon bearings. Lubricant will attract dirt and debris, cause premature wear on the bearings and increase steering effort.

NOTE: Do not attempt to disassemble U–joints. U–joint parts are not replaceable.



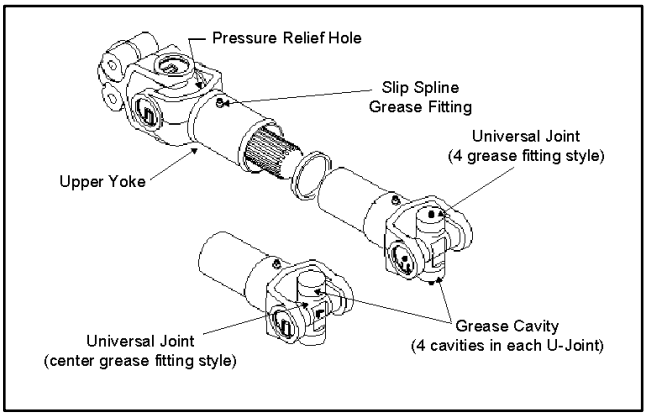
WORKMAN: Driveshaft Universal Joints

The Workman was designed as a high capacity utility vehicle; as a result, the transaxle drive shaft splines and universal joints are subjected to severe load and duty cycles. If not regularly and properly lubricated at the correct maintenance interval, premature universal joint wear may occur. It is possible that each universal joint bearing may not receive lubrication during greasing if the proper technique is not followed. Universal joints with a center fitting are more susceptible to improper lubrication methods.



Universal Joint Lubrication

Use a hand grease gun when greasing – do not use a pneumatic grease gun. When greasing universal joints, make sure that **all four seals are purged** and the cups are full of grease before you quit greasing. This flushes moisture and abrasive contaminants from each bearing assembly and ensures all four cavities are properly lubricated. If you are having trouble getting a cup to purge grease, rotate the driveshaft or move the driveshaft from side to side. On the cup mounted design (4 grease fittings), try greasing from the opposite grease fitting if a seal will not purge.



Slip Joint Spline Lubrication

Use a hand grease gun. Apply grease to the fitting until lubricant appears at the pressure relief hole at the upper yoke on the drive shaft. In cold temperatures, drive the vehicle immediately after lubricating to activate the slip spline and purge any excess lubricant. In cold weather the lubricant will get stiff and may cause excessive pressure that could force the relief plug from the end of the drive shaft when operated.

WORKMAN: Hitches

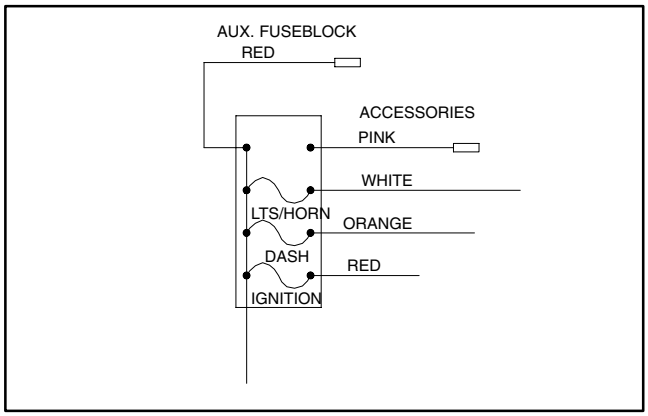
If you try to pull too much weight with the standard hitch, damage to the rear axle and leaf springs can occur. Always use the heavy duty hitch in an application that exceeds the capacity of the standard hitch.

The STANDARD hitch will handle a maximum of 1500 lbs. (680 Kg) Gross Trailer Weight and a maximum of 200 lbs. (90 Kg) tongue weight.

The two HEAVY DUTY hitches will handle 3500 lbs. (1587 Kg) Gross Trailer Weight and a maximum of 400 lbs. (180 Kg) maximum tongue weight.

WORKMAN: Installing Electrical Accessories

If installing electrical accessories on the the Workman, always hook the power lead to the 10 gauge (Pink) accessory wire coming from the fuse block. This wire is properly sized for the application and will ensure current is being drawn from the proper source on the machine. Attaching a power lead to any other circuit can cause problems with specific circuits and could overheat the wiring.



WORKMAN: Gross Vehicle Weight (GVW)

The Workman 3000 Series vehicles have a Maximum Gross Vehicle Weight (GVW) of 4,000 lbs. (1,814 Kg). GVW includes the weight of the machine, operator, passenger and loaded attachment. The weight of the vehicle with a 200 lb. (91 Kg) operator and 200 lb. (91 Kg) passenger is 1,400 lbs. (635 Kg). Subtracting the 1,400 lb. (635 Kg) vehicle weight, including the operator and passenger, gives a payload capacity of approximately 2,600 lbs. (1,180 Kg).

MULTI–PRO and WORKMAN SPRAYERS: Cold Weather Maintenance

Spray systems used in cold climates should be maintained before storing for the winter months. To prepare the spray system for cold weather, follow these steps:

1. Rinse the tank and operate the system with water only.

2. Add a few gallons of antifreeze solution to the tank and operate the system.

3. Drain the tank at the lower suction fitting.

4. Use WD40 or a light oil to coat the pump impeller.

5. Use compressed air to dry the flow meter, flow control valve and solenoid valves.

6. Leave all valves open.

MULTI–PRO and WORKMAN SPRAYERS: Calibration

Sprayer calibration is one of the most important factors in using sprayers for proper turf maintenance. Proper calibration will:

- Assure safety for the operator and others who use the turf.
- Help enhance the environment by getting rid of a pest. Accurate application has a positive effect on the environment. Inaccurate calibration can have a negative effect (no control, damaged turf, damaged soil).
- Give economical results. Over application wastes money, under application may require treatment again.

MULTI–PRO™ and WORKMAN SPRAYERS: Centrifugal Pump Seal

The centrifugal pump used in the Multi–Pro spray system uses a carbon rotating seal and a ceramic stationary seal. If the pump is run dry, (even for a short period of time) extreme head due to friction will damage the seal, causing it to leak. If run dry, ceramic seals will appear discolored and carbon seals will be pitted on the sealing surface.

Commercial Products

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